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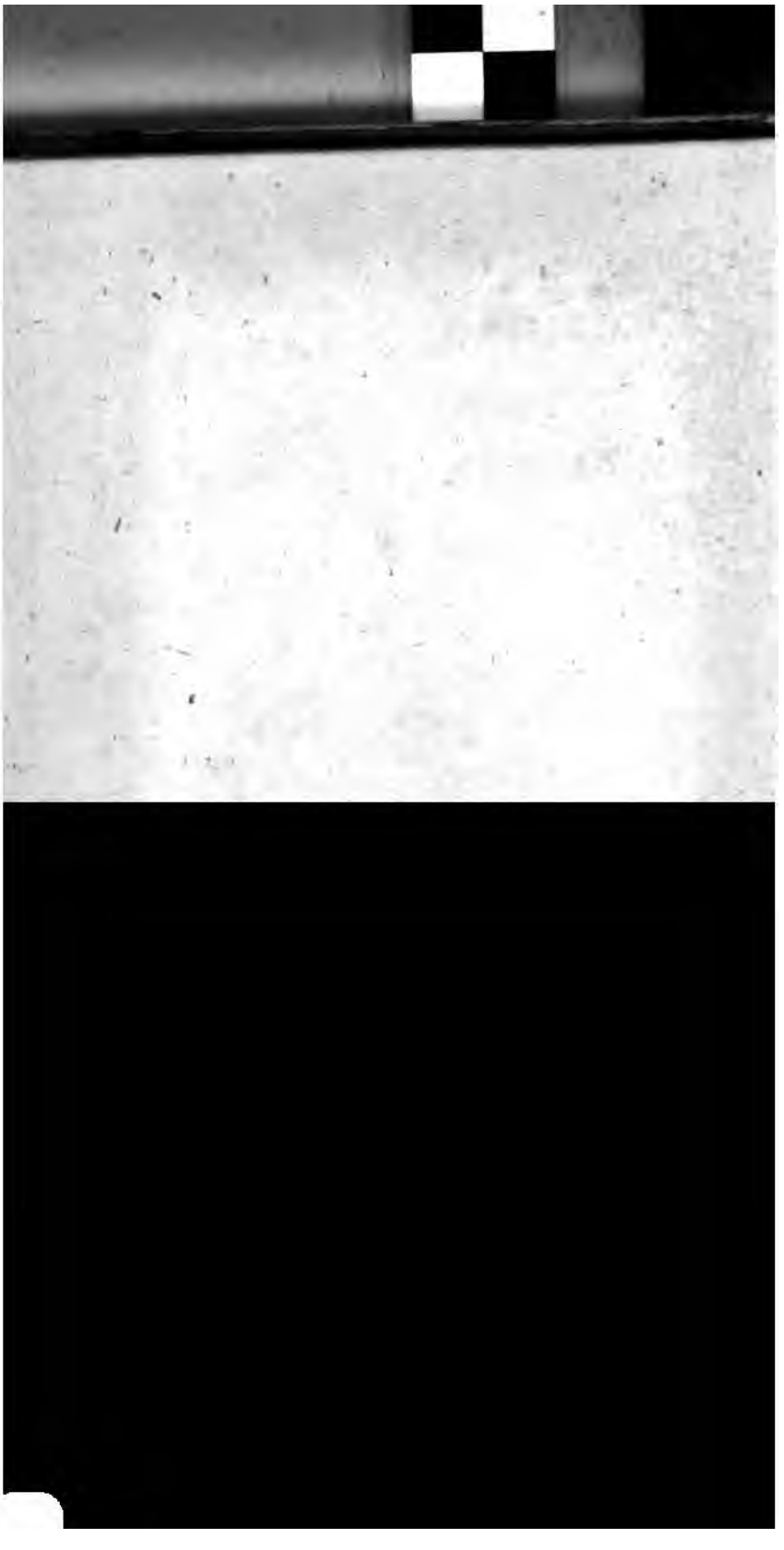


MISCELLANEOUS TRACTS

RELATING TO

NATURAL HISTORY,

HUSBANDRY,

AND

PHYSICK.

To which is added the

CALENDAR of FLORA.

By BENJ. STILLINGFLEET.

THE THIRD EDITION.

LONDON:

Printed for J. DODSLEY, in Pall-Mall; BAKER and LEIGH, in York-Street, Covent-Garden; and T. PAYNE, at the Mews Gate.

MDCCLXXV.

Homo naturæ miniſter et interpres tantum facit et intelligit, quantum de naturæ ordine, re vel mente obſervaverit: nec amplius ſcit vel poteſt. BACON.

TO THE

RIGHT HONORABLE

George, Lord Lyttelton,

Baron of FRANKLEY.

MY LORD,

BESIDES private motives of reſpect and honor, there is another of a public nature, which makes me deſirous to inſcribe the following ſheets to Your Lordſhip. I mean the zeal which You ſhewed in Parliament for ſecuring to this Country that noble collection of natural curioſities now repoſited in the Britiſh Muſeum; which cannot

fail in time to produce many good effects, and prove the truth of what Your Lordſhip obſerved, that the reputation and intereſt of the nation were highly concerned in that purchaſe. I am, with the greateſt regard,

MY LORD,

Your Lordſhip's moſt Obliged

and Humble Servant,

BENJ. STILLINGFLEET.

PREFACE

OF THE

TRANSLATOR.

THE following pieces were ſelected from many others publiſhed by ſeveral ingenious members of that great, and hitherto unrivalled ſchool of natural hiſtory, the univerſity of Upſal in Sweden, under the preſidence of Linnæus [a]. They

 were

[a] Linnæus Phil. Bot. p. 9. has theſe words, vid. diſſert. noſtra de ficu. Now there is a piece in Amæn. Acad. vol. 1. on this ſubject, in which the matter referred to is contained. This piece goes under the name of Cornelius Hegardt, tho' Linnæus plainly quotes it as his own. How

were ſelected not as the only, or even the moſt valuable, but as anſwering beſt the intention of the tranſlator; which was to make known more generally how far all mankind is concerned in the ſtudy of natural hiſtory, and thereby to incite ſuch as are properly qualified to proſecute, and encourage that branch of knowledge, and ſpread, as far as the nature of the thing is capable of, amongſt all orders of men in this nation, the improvements made in it by the excellent Linnæus. His name, it

more patience and time than are likely to fall to the ſhare of the generality of the world. My deſign therefore is not to exhort people indiſcriminately to ſtudy his works; but, as i obſerved before, to give them ſome idea how uſefull his purſuits are likely to become in many reſpects. There will appear, i imagine, ſuch great and extenſive views in relation to huſbandry, phyſic, and the general œconomy of human life in the few ſpecimens i have given, that in this age and nation, where every art and ſcience, that can be of any uſe to the public, are ſure to meet with generous encouragers, there will be found many who will readily promote any rational endeavour to puſh theſe diſcoveries farther, or put in practice ſuch hints, as may ſeem to bear a probable appearance of ſucceſs.

I can ſcarcely condemn mankind for treating with contempt a vertuoſo whom they ſee employed in poring over a moſs or an inſect day after day, and ſpending his life in ſuch ſeemingly unimportant and barren ſpeculations. The firſt and moſt natu-

ral reflections that will ariſe on this occaſion muſt be to the diſadvantage of ſuch purſuits. Yet were the whole ſcene of nature laid open to our views, were we admitted to behold the connections and dependencies of every thing on every other, and to trace the œconomy of nature thro' the ſmaller as well as greater parts of this globe, we might perhaps be obliged to own we were miſtaken; that the Supreme Architect had contrived his works in ſuch a manner, that we cannot properly be ſaid to be unconcerned in any one of them; and therefore that ſtudies which ſeem upon a ſlight view to be quite uſeleſs, may in the end appear to be of no ſmall importance to mankind. Nay, were we only to look back into the hiſtory of arts and ſciences, we muſt be convinced, that we are apt to judge over haſtily of things of this nature. We ſhould there find many proofs, that he who gave this inſtinctive curioſity to ſome of his creatures, gave it for good and great purpoſes, and that he rewards with uſefull diſcoveries all theſe minute reſearches.

It is true this does not always happen to the ſearcher, or his contemporaries, nor even, ſometimes to the immediate ſucceeding generation; but i am apt to think that advantages of one kind or other always accrue to mankind from ſuch purſuits. Some men are born to obſerve and record what perhaps by itſelf is perfectly uſeleſs, but yet of great importance, to another who follows and goes a ſtep farther ſtill as uſeleſs. To him another ſucceeds, and thus by degrees, till at laſt one of a ſuperior genius comes, who laying all that has been done before his time together, brings on a new face of things, improves, adorns, exalts human ſociety.

All thoſe ſpeculations concerning lines and numbers ſo ardently purſued, and ſo exquiſitely conducted by the Grecians; what did they aim at? or what did they produce for ages; A little arithmetic, and the firſt elements of geometry were all they had need of. This Plato aſſerts, and tho' as being himſelf an able mathematician and remarkably fond of theſe ſciences, he recom-

recommends the ſtudy of them, yet he makes uſe of motives that have no relation to the common purpoſes of life.

When Kepler, from a blind and ſtrong impulſe merely to find analogies in nature, diſcovered that famous one between the diſtances of the ſeveral planets from the ſun, and the periods in which they compleat their revolutions; of what importance was it to him or to the world?

Again; when Galileo, puſhed on by the ſame irreſiſtible curioſity, found out the law by which bodies fall to the earth, did he or could he foreſee that any good would come from his ingenious theorems, or was any immediate uſe made of them?

Yet had not the Greeks puſhed their abſtract ſpeculations ſo far; had not Kepler and Galileo made the above-mentioned diſcoveries; we never could have ſeen the greateſt work that ever came from the hands of man. Every one will gueſs that I mean Sir Iſaac Newton's Principia.

Some obſcure perſon, whoſe name is not ſo much as known, diverting himſelf idly

as a ſtander-by would have thought, with trying experiments on a ſeemingly contemptible piece of ſtone, found out a guide for mariners on the ocean, and ſuch a guide as no ſcience, however ſubtile and ſublime its ſpeculations may be, however wonderful its concluſions, would ever have arrived at. It was bare curioſity that put Sir Thomas Millington upon examining the minute parts of flowers; but his diſcoveries have produced the moſt perfect, and moſt uſefull ſyſtem of botany that the world has yet ſeen.

Other inſtances might be produced to prove, that bare curioſity in one age is the ſource of the greateſt utility in another. And what has frequently been ſaid of chymiſts, may be applyed to every other kind of vertuoſi. They hunt perhaps after chimæras and impoſſibilities, they find ſomething really valuable by the bye. We are but inſtruments under the Supreme Director, and do not ſo much as know in many caſes what is of moſt importance for us to ſearch after. But we may be

ſure

ſure of one thing, viz. that if we ſtudy and follow nature, whatever paths we are led into, we ſhall at laſt arrive at ſomething valuable to ourſelves and others, but of what kind we muſt be content to remain ignorant.

I am ſenſible that after all i have ſaid, or can ſay, many people will not be perſuaded to allow that the ſtudy of ſome parts of natural hiſtory can be worthy of a rational creature. They will never vouchſafe to look on moſſes and inſects in this light. Yet why may not the ſtudy of theſe likewiſe have its uſe in future times? It ought to be conſidered that the number of the latter is immenſe, that it is but lately that any great attention has been paid to them, that one of them is and has been long the means of cloathing thouſands and feeding more, that another affords us honey, another a fine dye, not to mention ſome few beſides, of acknowledged benefit to mankind. Laſtly, that they are capable of doing us the greateſt miſchief, and that it is poſſible that a more thorough knowledge of them

them may inſtruct us how to ſecure ourſelves againſt their attacks. Whether this be poſſible we can never know, till proper encouragement has been given to this branch of natural hiſtory. Something to the ſame purpoſe might be ſaid concerning moſſes, but as the intent of one of the following pieces is principally to take off ſuch objections as i have been conſidering, i ſhall dwell no longer on this ſubject; but proceed to give a ſhort account of what Linnæus has done towards the improvement of natural hiſtory, that the reader, who is unacquainted with his works, may form ſome idea, tho' very imperfect, of this great man. Firſt then, he has invented a new ſyſtem of botany, founded on the male and female organs of generation in plants, a ſyſtem which has thrown a new light over botany. He has defined about 10,000 plants, ranged them into claſſes, genera and ſpecies, given new and regular generical names to many inſtead of thoſe barbarous and uncouth ones which prevailed till his time, and added ſpecifical

names

names to all, ſhort, eaſy, and oftentimes ſignificant, a thing never ſo much as attempted before. He has brought into botany, a preciſion, conciſeneſs, and elegance, that were very much wanted. He has obſerved and given names to ſome parts of plants not taken notice of by any other botaniſt, parts which in ſome caſes are ſufficient as well as neceſſary to diſtinguiſh the genus and the ſpecies.

The Philoſophia botanica[b] of this author affords throughout inſtances of this reformation. Had he wrote no other book but this, he would have deſerved the higheſt praiſe from all lovers of botany. For beſides the improvements juſt mentioned it comprehends in a ſhort compaſs ſome-

[b] In the year 1750, when he was writing this book, as he tells us in the preface to it, he was hindered from going on by a terrible fit of the gout, that broke the ſtrength of his mind as well as body. In the year 1755, he ſays, Flor. Suec. article 450, that he had been freed from the gout for ſome years by eating great quantities of freſh ſtrawberries. He adds that this fruit diſſolves the tartar of the teeth, that it is remarkably good for people afflicted with the ſtone or gout, and that it may be ſafely eaten in abundance.

thing of conſequence in every branch of that part of natural hiſtory, and affords hints for various diſcoveries, hints that muſt, if purſued, produce many conſiderable improvements in phyſic, huſbandry, and œconomy.

He has publiſhed a Materia medica ſo far as relates to plants, in which he has undertaken to determine many ſpecies commonly uſed, but not ſufficiently aſcertained, adding throughout in the ſhorteſt manner poſſible what he has found to be uſeleſs or efficacious, and as he aſſures us never highly recommends any without being thoroughly convinced of their vertues by his own experience in the hoſpitals where he preſided. Some of theſe medicines have not yet, i believe, been received into our ſhops, but they may poſſibly deſerve conſideration.

In the laſt edition of his Syſtema naturæ he has mentioned above 1500 ſpecies of inſects, has claſſed them all, divided them into genera and ſpecies, deſcribed them as to the minuteſt parts ſo far as was neceſſary to diſtinguiſh them, marked the places where

where they are to be found, the plants they feed upon, their transformations, cited the authors who have treated on them, given them claſſical, generical, and trivial, or ſpecifical names; has done the ſame by birds, fiſhes, and all other known animals; has ranged all the foſſils, minerals and ſtones, to uſe his language, in a manner partly borrowed, and partly founded on his own obſervations. But what improvements and additions he has lately made to this part of natural hiſtory, as well as that of plants, we cannot ſay till the other part of his new edition of the Syſtem of nature comes out, which is expected daily. However what we ſee he has done in relation to animals, leaves us no room to doubt but that it will altogether be the moſt extraordinary book that was ever publiſhed in this or almoſt any other way.

Beſides his writings, of which i have mentioned but a ſmall part, this indefatigable man, born to be nature's hiſtorian, has travelled over Lapland, all Sweden, part of Norway, Denmark, Germany,

Holland, England, and France, in ſearch of knowledge. That part of his travels which is publiſhed in Latin has many curious and uſeful obſervations relating to the purpoſes of common life. Of thoſe which are written in his own tongue i cannot give any other account, but that by ſome quotations from them to be found in the writings of his diſciples it appears, that they very well deſerve to be communicated to the world in a language more generally underſtood.

Beſides theſe labours of his own, the world will be one day obliged to him for what others have done. Incited by his example and perſuaſion, C. Ternſtrom went into Aſia; P. Kalmius to Penſilvania and Canada; L. Montin into one part of Lapland; D. Selander into another; F. Haſſelquiſt into Ægypt and Paleſtine; O. Toren to Malabar and Surat; P. Oſbech to China and Java; P. Loefling to Spain and America; P. J. Berg to Gothland; M. Koehler to Italy and Apulia; and D. Rolander to Surinam and St. Euſtacia; all

theſe with a view to the promotion of natural hiſtory. When we conſider him in this light of a maſter of ſuch diſciples as theſe, and many others, ſome of whoſe works make up the following book, he muſt appear like Homer at the head of the poets, Socrates at the head of Greek moraliſts, and our Newton at the head of the mathematical philoſophers. Among all theſe extraordinary qualifications there appear throughout his writings ſpirit, candor, a due regard for others, and proper modeſty and diffidence of himſelf.

I will give a ſhort ſpecimen of his way of thinking in relation to the degree of human knowledge hitherto attained by man on the ſubject of natural hiſtory. A ſubject on which it was very natural for a leſs extenſive genius to be vain, as he has had ſo great a ſhare himſelf in the advancement of it. The paſſage is taken out of the introduction to the new edition of his Syſtem of nature, and is to this effect. 'How 'ſmall a part of the great works of nature 'is laid open to our eyes, and how many

'things are going on in ſecret which we 'know nothing of! How many things are 'there which this age firſt was acquainted 'with! How many things that we are ig-'norant of will come to light when all 'memory of us ſhall be no more! For 'nature does not at once reveal all her ſe-'crets. We are apt to look on ourſelves as 'already admitted into the ſanctuary of her 'temple, we are ſtill only in the porch. I 'have entered, adds he, into the thick and 'ſhady woods of nature, which are every 'where beſet with thorns and briars. I 'have endeavored as much as poſſible to 'keep clear of them, but experience has 'taught me that there is no man ſo cir-'cumſpect as never to forget himſelf, and 'therefore i have born with patience the 'ſneers of the malevolent, and the buffoo-'neries of thoſe whoſe vivacity is exerted 'only to moleſt and give offence to others. 'I have, in ſpite of theſe inſults, kept on 'ſteadily in my old path, and have finiſhed 'the courſe i was deſtined for.'

The latter part of this paſſage, ſhews that he has not been without his enemies, and that he hath ſuffered in the ſame way that all the moſt curious enquirers into nature have done in all ages. The tartneſs of his expreſſions, which is ſtill ſtronger in the original, plainly proves that they have not uſed fair arguments againſt him, but like intereſted rivals, or men of a ſuperficial underſtanding, have endeavored to ſubject him and his labors to ridicule. But whatever has been his fate in his own countrey, as far as i know, his name is almoſt univerſally mentioned with reſpect in all other parts of Europe. It is true, objections have been made to his innovations in other places beſides Sweden[c], which

[c] Having ſince the firſt edition of theſe tracts met with Browellius' anſwer to Siegeſbec, M. D. and botanical profeſſor at Peterſburg; who wrote againſt the ſexual ſyſtem of Linnæus, i cannot omit quoting one of his objections, which i imagine will divert the reader, at the ſame time that it may ſerve as an inſtance how far zeal for old notions will ſometimes carry men. The objection is, that the laws of nature are overturned by Linnæus,

which muſt unavoidably happen on many accounts, but particularly becauſe thoſe natural hiſtorians who had been brought up and inured to other ſyſtems, who

Linnæus, ſince polygamy and adultery would be according to his ſyſtem allowed in the vegetable world; for in ſome plants there are many filaments to one piſtil. This is polygamy. In others there are female flowers, which are impregnated by the duſt of male flowers, which have other female flowers belonging to them, i. e. which are already married. This is plainly adultery. Now according to profeſſor Siegeſbec, it is not credible that ſuch confuſion and deteſtable pollution ſhould be tolerated in nature.

Browellius rightly obſerves in his anſwer, that Siegeſbec had totally overlooked many inſtances of theſe enormities in the animal kingdom, and even the immorality of farmers and their wives, ſhepherds, jockies, ſportſmen, nay even ladies of reputation, who in their ways promote theſe immoral and indecent practices.

However it muſt be obſerved in favor of this very ſcrupulous profeſſor, that ſyſtems of philoſophy, founded on facts, have been anathematiſed, and the authors and favorers of them condemned to the ſevereſt puniſhments, for reaſons as little to the purpoſe as the foregoing of Siegeſbec. To quote inſtances would be endleſs, as every one the leaſt converſant in the hiſtory of learning will eaſily recollect them. But ſo moderate is the world now become, that i do not hear that the Linnæan ſyſtem is looked on as heretical even at the court of Rome, though the profeſſor has drawn ſome ſhrewd arguments againſt it from the book of Geneſis.

had learned things by other names, and could not eaſily attain the new ones, muſt have ſtrong prejudices ariſe on this occaſion. This objection being perſonal i ſhall not conſider it any farther, but readily allow that great indulgence is due to ſuch people, and that their fate is to be pitied for coming into the world too ſoon to be enlightened farther on ſubjects, that perhaps had employed the greateſt part of their life. But there are prejudices of another ſort which i cannot omit to conſider more fully on this occaſion.

In order to this it muſt be premiſed, that the uſe and intent of a claſſical ſyſtem in any part of natural hiſtory, is not to range things according to their natural connections in regard to their outward aſpects, or eſſential qualities, or their medicinal or œconomical properties, but to range them in ſuch a manner that upon a plant, mineral or animal being ſhewn to a naturaliſt he may certainly, upon a due inſpection of the object, give its true name according to ſome ſyſtem. He who goes farther

farther than this is not barely a naturaliſt, but ſomething more, viz. a phyſician, a chymiſt, a farmer, a gardener, &c. And he who cannot go thus far to a certain degree, does not deſerve the name of a naturaliſt, however ſkillfull he may be in the vertues and properties of bodies animate and inanimate.

The uſe then and intent of a claſſical ſyſtem is nothing more than that of a dictionary, where no one complains that words totally unconnected in ſenſe are put near one another. The queſtion therefore as to the ſexual ſyſtem [d], v. g. in plants, is not whether they be ranged naturally, but whether in the beſt manner poſſible in order to be known. Nay farther, it matters not whether the ſexual ſyſtem be founded on nature or not, i. e. whether there be any

[d] At the end of the preface I have endeavored to explain the meaning of theſe terms in ſuch a manner, that I think any curious perſon that will be at the pains to compare my explication with nature, cannot fail to underſtand perfectly what they mean in general. I thought this method would be more agreeable to the reader than to be referred to other books.

propagation by ſeeds without male and female organs of generation. The whole to be conſidered is whether thoſe parts which are called, and, i believe truly called ſo, do really exiſt, and whether they for the moſt part exiſt ſo uniformly, as to furniſh marks ſufficient to diſtinguiſh the claſſes, &c. by. Nor does it matter whether it be hard to diſtinguiſh thoſe marks, but whether they can with proper care and patience be diſtinguiſhed, and whether we can ſurely diſtinguiſh plants, without obſerving thoſe nice and minute parts, and whether a ſyſtem has been found equally ſure with the Linnæan without having regard to thoſe parts. Thoſe who think ſo would do well to inform the world of their diſcovery, and not make objections that affect only the obſcurity of nature, when they mean to condemn a ſyſtem which is obſcure merely from its conſonancy to nature. If Providence has thought fit to write in cyphers, ſhall he be blamed who endeavors to give a key to its works, becauſe

ſome

ſome men cannot diſtinguiſh one ſtroke from another in the cypher?

Thoſe who have not learned to read the characters of nature for want of leiſure, patience, or any other cauſe, ought not to complain that Linnæus cannot make them ſkillfull in a part of knowledge they are not qualified for. If a man unacquainted with the learned languages wants to know the meaning of a Greek word, will he complain of the lexicon, becauſe he cannot find it? certainly not. Neither ought we to complain of Linnæus in a ſimilar caſe.

This i think is a full anſwer to all the objections that have or can be made to his ſyſtem in general. What errors he has committed according to his own principles in relation to particulars is quite another queſtion. I am one of thoſe who think him not free from errors. Nor is it wonderfull that he ſhould fall into ſome, but it is truly wonderfull that one man ſhould be able to invent and carry ſo far ſo nice and extenſive a ſyſtem, eſpecially when we conſider not only what he has done in botany, but what he has done in all the branches of

natural hiſtory beſides, and ſome of them almoſt entirely neglected before his time. I ſhould therefore wiſh that thoſe who are fond of this part of knowledge would, inſtead of making frivolous objections, try by an accurate and diligent examination to rectify his miſtakes, and thereby help to perfect a ſyſtem which deſerves the utmoſt attention, and commendation.

Tho' i ſaid above that it matters not whether the ſexual ſyſtem be founded on nature or not; yet it was natural for the inventor of it to endeavor by all proper means to vindicate it as likely to be ſo, and this he has done to the ſatisfaction of the moſt curious obſervers; and i will venture to add that it is natural for others likewiſe to embrace with zeal a ſyſtem, that puts the works of Providence in ſo new and beautiful a light by continuing the analogy from the animate to the inanimate creation. It ſeems as if Providence intended to lead men to this diſcovery by ſtriking our ſenſes ſo intenſely and ſo agreeably with thoſe very parts which contain the clue of this ſyſtem. Yet ſuch is the inattention and

in-

inaccuracy of man on certain points, that even a tolerable conjecture concerning the uſe of thoſe parts was not made till the year 1676.

Having finiſhed all that i think neceſſary to ſay concerning Linnæus and his works, i ſhall now come to what relates immediately to myſelf only. Firſt then as to the tranſlation, i have endeavoured to avoid making it too literal, and ſervile, but yet i hope without taking any undue liberties, or deviating from the ſenſe of the originals.

The part which is likely to prove leaſt agreeable to the reader, is that which was moſt troubleſome to the tranſlator. I mean the names of things not generally known. Some of theſe i have been obliged to leave in Latin, not being able to find any Engliſh names for them. I will not pretend to have avoided all miſtakes on this head, but it is certain i ſhould have committed more, as well as have had much more trouble, had it not been for the aſſiſtance of the ingenious Mr. Hudſon, whoſe ſkill in all the branches of natural hiſtory, and particularly

cularly thoſe relating to his profeſſion as an apothecary, cannot fail to recommend him to the favour of the public. To him i likewiſe owe the aſcertaining of ſome of the graſſes, one of which, viz. the ſmall bent graſs which i had in my collection, but knew not where i found it, he diſcovered to be the gramen minimum anglobritanum, mentioned in the indiculus plantarum dubiarum at the end of Ray's Synopſis.

I muſt not omit alſo on this occaſion to acknowledge my obligation to that excellent botaniſt Dr. Watſon, for favoring me with a peruſal of his collection of graſſes, which was of no ſmall ſervice to me.

But to return to the tranſlation; I ſaid that i did not pretend to have avoided all miſtakes in relation to the names of things, i will now extend this farther, and own my ſuſpicions that i may have made ſome in relation to other particulars, but i hope they are of ſuch a kind only as may be looked on with indulgence by the learned, eſpecially when they conſider the great variety of ſubjects

jects treated on in theſe pages, of none of which ſubjects i profeſs to be a maſter, and therefore do not undertake to teach ſuch readers; but on the contrary ſhall always be ready and even deſirous to receive inſtructions from them. I beg they will alſo conſider that i do not aim at letting the unlearned into the myſteries of this part of knowledge, or even teaching them the elements of it. My buſineſs is only to excite curioſity, and therefore ſmall errors can be of no conſequence. What i have farther to ſay will be found in notes.

Res ſummas initio deberi parvo ac debili experientia omnium temporum teſtatur. Amænit. Acad. vol. 2. p. 266. §. 2.

End of the PREFACE.

IN

IN order to explain the ſexual ſyſtem, i ſhall make uſe of the lilly, as that plant is almoſt every where to be found, and as the parts of generation are in that more obvious, than perhaps in any other flower. Upon opening the flower leaves there will appear in the very center, at the bottom, an oblong thickiſh ſubſtance with ſix furrows along its ſides. This contains the ſeeds, and is called

The germen or germ.

On this ſtands a ſmall kind of pillar called

The ſtyle.

Which is terminated by a thickiſh triangular head, called

The ſtigma.

Theſe all together form the female part of the flower, and are called by one name,

The piſtil.

Round this piſtil grow ſix long thready ſubſtances, called

The filaments,

Each terminated by an oblong body, that plays as on a pivot, upon the leaſt motion

tion being given to the flower, and is called

The anthera.

This anthera contains the male duſt, which when ripe is ſcattered about by every breath of air, and what happens to fall on the ſtigma, or upper part of the piſtil, is ſuppoſed to enter thro' the ſtyle into the germ, and there impregnate the ſeed.

This plant is called an hermaphrodite, becauſe the male and female organs of generation are contained within one flower. Moſt plants are hermaphrodites, like this, and have ſomething analogous to what i have deſcribed above. Some plants have the male and female parts ſeparate on the ſame individual; others have male parts on one plant and female on another.

The part of the flower that contains honey, is called

The nectary.

Only a few plants have this part, the lilly has it; but as the knowledge of it is not neceſſary for underſtanding the following pieces, i ſhall not trouble the reader with a deſcription of it.

CON-

CONTENTS.

AN oration concerning travelling in one's own countrey, by Dr. Linnæus — — page 1

The œconomy of nature, by Iſaac Biberg —— ——— —— 37

On the foliation of trees, by Harald Barck —— ——— —— 131

Of the uſe of curioſity, by Chriſtoph. Gedner —— — —— 159

Obſtacles to the improvement of phyſic, by J. G. Beyerſtein —— 201

The calendar of Flora — — 229

The Swediſh Pan, by Nicholas Haſſelgren — —— — 339

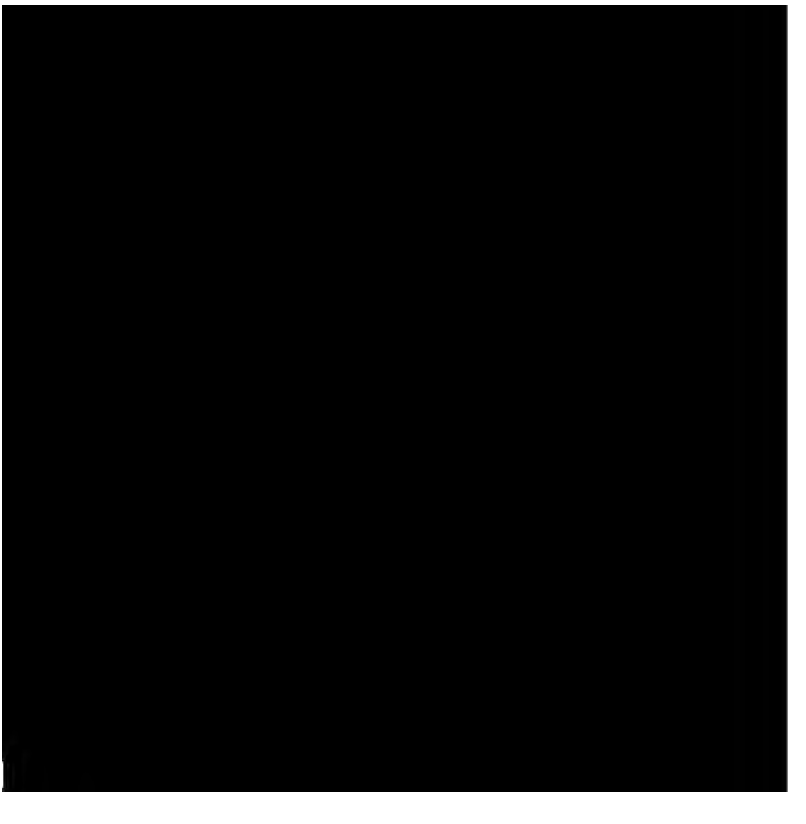
Obſervations on graſſes, by the Tranſlator —— —— —— 363

[redacted]

BENEFIT

OF

TRAVELLING, &c.



Miſcellaneous Tracts, &c.

An ORATION concerning the neceſſity of travelling in one's own countrey, made by Dr. LINNÆUS at Upſal, Oct. 17, anno 1741, when he was admitted to the royal and ordinary profeſſion of phyſic.

Amœnitat. Academ. vol. ii.

MOST honorable and moſt learned auditors of all orders, i am going to undertake a province allotted to me by the favor of our moſt auguſt, and moſt potent monarch, whoſe will it is that i preſide over, and direct the ſtudy of phyſic in this Univerſity; and that i do my utmoſt to advance the glory of this illuſtrious body. May his choice be crowned with ſucceſs, and may the great and good God favor my undertaking.

As by cuſtom, delivered down by our forefathers, and preſcribed by the laws of our aca-

demy, i am obliged upon undertaking this province to ſay ſomething before ſo illuſtrious a circle of fathers and citizens; i confeſs that all thoſe circumſtances, each of which is apt to ſtrike terror into the mind of man, offer themſelves together in a croud before my eyes on this occaſion. For whether i conſider the ampleneſs of the place, or the dignity of the audience, or the multitude of choſen people, or laſtly my little talents in the arts of ſpeech; all theſe circumſtances, i ingenuouſly confeſs, throw me into no ſmall confuſion.

For if the moſt eloquent men, when they come to ſpeak in public, have been known to tremble, and become incapable of uttering a ſingle word; what muſt i feel who have none of the common advantages, either from art or nature, in the readineſs and elegance of ſpeech?

However, ſince I am under a neceſſity of ſaying ſomething, i muſt fly for refuge to that favor, and humanity, which you never refuſe to thoſe who ſpeak on theſe occaſions; and thus i doubt not but that, however deficient i may be from want of talents, or want of exerciſe, i ſhall not wholly fail of the end i aim at. I ſhall therefore, moſt honorable auditors, undertake to treat on a ſubject neither unſuitable to

the preſent occaſion, nor to the office i am going to enter into, nor to that employment which i was lately engaged in by the will, and ſuffrage of the high, and mighty ſtates of this kingdom; and from which i am now once again brought back to this ſeat of the muſes. Nay ſo far is the ſubject i am about to treat on, from being unſuitable to any of theſe circumſtances, that it ſeems to me particularly adapted to every one of them. The ſubject is concerning the neceſſity of travelling in one's own countrey, and the advantages that may thence accrue, eſpecially to phyſicians. I ſhall treat it in a plain and popular manner; and endeavor to manage it ſo, that the meanneſs of my language may be compenſated by the dignity of the matter, and the brevity of my expreſſions.

All human knowledge is built on two foundations; reaſon and experience.—Theſe two joyned together are neceſſary to make a good phyſician.

We muſt confeſs indeed, that the buſineſs of reaſoning may be carried on with equal ſucceſs in our cloſets, as in travelling, ſuppoſing we have an opportunity of converſing with men truly learned.

But it was experience, that ſovereign miſtreſs without which a phyſician ought to be aſhamed to open his lips; it was experience, i ſay, that conſecrated to immortality ſo many of the antients, and amongſt the reſt that divine old man Hippocrates, whoſe writings were publiſhed many ages before chriſtianity. The writings of this wonderful man alone, among ſo many ingeniouſly contrived ſyſtems, remain to this day, and will for ever remain firm, unmoved, unſhaken, untouched by any decay, by any change. It is experience that has adorned with laurels the heads of ſo many celebrated phyſicians in all times, and even now adorns. And hence it is that the chief and moſt honorable title of phyſician is to be called a man of experience. Experience ought to go firſt; reaſoning ſhould follow. The former furniſhes the materials of knowledge; the latter holds her conſultations on the given phænomena; and when ſhe has weighed with judgment every circumſtance, ſhe diſcovers truth, and concludes, orders, and determines rightly about the point in queſtion. Experience ought to be animated by reaſon in all phyſical affairs; without this ſhe is void of order, void of energy, void of life. On the other hand reaſon with-

without experience can do nothing; being nothing, but the mere dreams, phantaſms, and meteors of ingenious men who abuſe their time. The antients certainly did not, any more than we, bring experience into the world with them. There is need of much diligence and labor, before man can be thoroughly inſtructed. Dioſcorides confeſſes, that he undertook many journies in order to increaſe experience; and the other fathers of phyſic in their writings frequently make mention of their travels either expreſsly or tacitly.

Academies were inſtituted to the end, that men well verſed in all kinds of literature, and enriched beſides by much experience, might be invited thither, and that the youth, who were ambitious of becoming learned, might flock together to thoſe ſeats; and have the advantage of improving no leſs by the experience, than by the erudition of the profeſſors; and theſe qualifications combined together, which is of all alliances the moſt pleaſing, very juſtly deſerve the utmoſt veneration and reſpect.

Vaſt and ſumptuous libraries are erected in academies; in which the obſervations of the learned, like ſo many legacies, and donations,

are preſerved; that they who diligently give themſelves up to ſtudy, may become endued with learning, poliſhed, and confirmed by experience. Theſe libraries are the repoſitories of wiſdom, and their ſtores are laid open to every ingenious candidate.

Hoſpitals are founded that the candidates of phyſic may learn thoſe things at the patients bed ſide, which cannot be learned from books; for here practice, and experience ſhew their force by means of the eyes, and hands; as he paints any object moſt accurately, who paints from the idea, which his own eyes afford him, and not from that, which he gets by the relation of another.

Anatomy ſchools are erected, that we may behold in another's body, as it were in a glaſs, the nature, and conſtitution of our own; as thoſe conceive more clearly the ſituation of countries, diſtricts, and cities, and the manners, rites, and cuſtoms of their inhabitants, who themſelves have been there, and have ſeen what is remarkable amongſt them with their own eyes, than he who relies ſolely upon the vague and imperfect maps, and relations of travellers.

Phyſic gardens are here cultivated; where the plants of various kinds are collected from all parts of the globe, that we may by this means behold, as it were, the great in the little world.

Hither inſtruments for experimental philoſophy are brought together, that the abſtruſe forces of the elements, which otherwiſe would eſcape our ſenſes, may be made manifeſt, and that ſo we may ſucceſsfully be let into the very receſſes of nature; as far as human penetration will admit of.

All theſe things are inſtituted in academies, that the youth may arrive at knowledge by experience; all tend to this end, that tho' we be confined to one ſpot, one corner of the earth, we may examine the great and various ſtores of knowledge, and therein behold the immenſe domains of nature, and get acquainted with ſuch things, as otherwiſe muſt be ſought for, and oftentimes in vain, over the whole globe.

In my opinion therefore ſtudying at academies ought by no means to be neglected, but rather ſhould be looked upon as neceſſary to thoſe, who are ambitious of attaining wiſdom, ſupported by experience. And thoſe who endeavor

deavor to inſtill into the minds of young people a contempt for univerſities, and to withdraw the ſtudious from theſe ſeats of learning, ſuggeſt very pernicious advice; not conſidering that in theſe ſtorehouſes of knowledge much greater, and more excellent things may be attained by means of experience in a very ſhort ſpace of time, than by the moſt multifarious, moſt indefatigable, and moſt extenſive reading at home all one's life.

If i may be allowed to ſpeak what is really fact, this our univerſity may contend with any foreign one whatever for true, and ſolid learning in all thoſe parts of knowledge, which i have enumerated, owing to our noble, and exemplary inſtitutions. For we begin to excell in botanical gardens, in hoſpitals, in apparatus's for experimental philoſophy, in anatomical preparations, and other helps for arts and ſciences, and to excell ſo much that we are likely in time, by the bleſſing of the almighty, to be inferior to no univerſity.

Although ſome univerſities excell others on account of certain advantages peculiar to themſelves; for in proportion as one kind of knowledge in this, or that nation is held in greater, or leſs eſteem, and is therefore

more or leſs cultivated, ſo the profeſſors of it will be more or leſs ſkillful; as at this time the hoſpitals at London both for number and goodneſs exceed all others, at Paris chirurgical operations, at Leyden anatomical preparations, at Oxford botanical collections; tho', i ſay, this may be the caſe, yet i cannot think, that thoſe act prudently, or enough conſult the good of themſelves, and countrey, who ſeek for that abroad, which may be had at home, and who travel to foreign univerſities, before they have laid a ſufficient foundation in their own countrey. And there is no doubt but that they who do ſo will at laſt repent of their error. He, who goes abroad raw, and ignorant, ſeldom returns more learned. Whereas, he, who has ſpent his time well at his own univerſity, will never find reaſon to repent. Whoever has employed himſelf properly in the ſtudy of the arts, and ſciences will become an uſefull, and ſolid man in every branch of buſineſs. Whoever, before he ſets out to viſit regions warmed by other ſuns, has laid the firſt foundations of his ſtudies in his native countrey, will be moſt likely to bring back materials of far greater price than we uſually ſee amongſt the greateſt part of our

travellers, who ſeldom return home laden with any thing, but fine ſounding, and empty words collected out of the European languages. What do they learn, but to prate about theatres, and plays, and the modes of dreſs amongſt the Italians, the Spaniards, the Germans, and above all the French? If they were well adviſed they would not ſtir a foot out of their own countrey; that they might not deſtroy their fortunes, their time, their health, nay their very life itſelf by luxury, and voluptuouſneſs. They would not then return, as too frequently happens, entirely uſeleſs to themſelves, and countrey, and a burthen upon the face of the earth. But whither am i hurried?

My deſign was, in the little time allotted me, to ſpeak to you, gentlemen, not of the peculiar advantages of univerſities, or of ſojourning at this, rather than any foreign one; but chiefly of travelling in one's own countrey, thro' its fields and roads; a kind of travelling, I confeſs, hitherto little uſed, and which is looked upon as fit only for amuſement. I once more, moſt honorable auditors, beg your patience, and that i may not forfeit all right to your favor, and benevolence, i promiſe to be as ſhort as poſſible. You know what the poet ſays,

The

The farmer talks of graſſes and of grain,
The ſailor tells you ſtories of the main.

You ought not therefore to wonder, that i chooſe to make travelling in one's own countrey the ſubject of my diſcourſe. Every one thinks well of what belongs to himſelf, and every one has pleaſures peculiar to himſelf. I have travelled about, and paſſed over on foot the froſty mountains of Lapland, have climbed up the craggy ridges of Norland, and wandered along its ſteep hills, and almoſt impenetrable woods. I have made large excurſions into the foreſts of Dalecarlia, the groves of Gothland, the heaths of Smoland, and the unbounded plains of Scania. There is ſcarcely any conſiderable province of Sweden, which i have not crawled through and examined; not without great fatigue of body and mind. My journey to Lapland was indeed an undertaking of immenſe labor; and i muſt confeſs, that i was forced to undergo more labor, and danger in travelling thro' this one tract of the northern world, than thro' all thoſe foreign countreys put together, which i have ever viſited; though even theſe have coſt me no ſmall pains, and have not a little exhauſted my vigor. But love to truth, and gratitude towards the ſupreme

preme being oblige me to confeſs, that no ſooner were my travels finiſhed, but, as it were, a Lethæan oblivion of all the dangers, and difficulties came upon me, being rewarded by the ineſtimable advantages, which i reaped from thoſe devious purſuits. Advantages, the more conſpicuous for that i became daily more and more ſkillful, and gained a degree of experience, which i hope will be of uſe to myſelf, and others; and, what i eſteem above all other conſiderations; as it comprehends in one all other duties, and charities; to my countrey, and the public.

Good God! how many, ignorant of their own countrey, run eagerly into forreign regions, to ſearch out and admire whatever curioſities are to be found; many of which are much inferior to thoſe, which offer themſelves to our eyes at home. I have yet beheld no forreign land, that abounds more with natural curioſities of all kinds, than our own. None which preſents ſo many, ſo great, ſo wonderfull works of nature; whether we conſider the magazines of ſnow heaped up for ſo many ages upon our Alps, and amongſt theſe vaſt tracks of ſnow green meadows, and delicious vallies here and there peeping forth, or the lofty heads

heads of mountains, the craggy precipices of rocks, or the ſun lying concealed from our eyes for ſo many months, and thence a thick Cimmerian darkneſs ſpread over our hemiſphere, or elſe at another ſeaſon darting his rays continually along the horizon. The like to all which in kind, and degree, neither Holland, nor France, nor Britain, nor Germany, nor laſtly any countrey in Europe can ſhew; yet thither our youth greedy of novelty flock in troops. But it was not my intent to ſpeak of theſe things at preſent. I come now cloſer to my purpoſe, being about to ſhew by inſtances, that the natural philoſopher, the mineralogiſt, the botaniſt, the zoologiſt, the phyſician, the farmer, and all others, initiated in any part of natural knowledge, may find in travelling thro' our own countrey things, which they will own they never dreamed of before. Nay things which to this day were never diſcovered by any perſon whatever. Laſtly, ſuch things, as may not only gratify, and ſatiate their curioſity; but may be of ſervice to themſelves, their countrey, and all the world.

To give a few examples. The ſagacious ſearcher after nature will find here wherewithall to ſharpen, and exerciſe his attention in beholding

holding the top of mount Swucku, of ſo immenſe a height, that it reaches above the clouds. The wonderfull ſtructure of mount Torſburg, the horrid precipices of the rock Blakulla in an iſland of that name, ſituated near Oeland, and that preſents by its name, ſtill uſed among the Suegothic vulgar, no leſs than by its diſmal aſpect, an idea of the ſtupidity, and ſuperſtition of that antient people.

Beſides the wonderfull vaults and caverns of the Skiula mountains, the high plains of the iſland Carolina, the unuſual form and ſtructure of the Kierkerſian fountains in Oeland; to paſs over numberleſs other ſtrange works of nature, the like to which perhaps are no where to be met with.

Where can we have greater opportunities, than in this Suegothic tract, of conſidering the intenſe rigor, and vehemence of winter, the incredible marble-like ſtrength of ice? And yet in this inclement climate grain of all ſorts is obſerved to ſpring forth ſooner, grow quicker, and ripen in leſs time than in any other part of the world.*

* Vid. a treatiſe concerning the foliation of trees publiſhed in this collection, and the prolegomena to the Flora Lapponica of this author, where he ſays that at Purkyaur in Lapland anno 1732. barley ſown May 31. was ripe July 28. i. e. in 58 days; and rye ſown May 31. was ripe, and cut Aug. 5. i. e. in 66 days.

Whoever deſires to contemplate the ſtupendous metamorphoſes of ſea, and land, will ſcarcely find any where a more convenient opportunity, than in the ſouth, and eaſt parts of Gothland; where the rock-giants, as they are called, ſeem to threaten heaven, and where the epocha's of time, the ages, the years, if i may ſo ſay, are as it were carved out in a ſurpriſing ſeries upon the ſea-ſhore, and the ground above the ſhore.

The philoſopher will find room to exerciſe his ingenuity ſufficiently in the Oeland-ſtone, by trying to diſcover how to overcome its moiſt nature, and quality, which whoever could accompliſh would do no ſmall ſervice to his countrey, and above all would infinitely oblige the inhabitants of that place.

I ſhall ſay no more than what is known, and confeſſed by all the world, when i ſay that there is no countrey in the habitable part of the globe, where the mineralogiſt may make greater progreſs in his art, than in this our countrey. Let any one, that can, tell me, in what regions, more rich, and ample mines of metal are found, than in Sweden, and where they dig deeper into the bowels of the earth than here.

Let the mines of Norburg, the ridge of Taburga, the pits of Dannemore, Bitſberg, Grengia, and laſtly the immenſe treaſures of Salbergen, and Fahluna be my witneſs, which exceed all in the known world.

Where do the poſſeſſors ſuffer forreigners more freely to approach their furnaces, and obſerve their operations? where are there men more ready to communicate their knowledge? Strangers are received by us with civility, and even preſſed to ſtay.

Who would not ſhudder on beholding thoſe forges, vomiting forth immenſe clouds of fire and ſmoak, where our iron ores are melted? who would not behold with pleaſure the ſimple countreyman in the thick pine-groves of Dalecarlia, without furnace, without any apparatus, extracting an iron ſo very fit for uſe, that it yields to no other, tho' prepared with the fierceſt fires, and greateſt expence?

Who ten years ago would have imagined, that the *lapis calaminaris* was to be had in Dalecarlia? or mines of the very beſt kind of *gold* in Smolandia?

You will perhaps ſcarce believe me when i tell you, that there are whole mountains full of *petroleum* in Dalecarlia. Yet doubt not. This thing

thing hitherto unheard of, unſeen, i myſelf ſaw with theſe eyes, and was ſurpriſed.

We admire the abundance of *coral* on the Indian ſhores, yet the port of Capellus in Gothland alone equals, nay exceeds thoſe riches of the eaſt. I have ſeen deep ſtrata of *corals* extending many furlongs, many miles along its ſhores.

Botaniſts, who have travelled over the greateſt part of the globe in ſearch of the treaſures of the vegetable kingdom, have yet left many plants for us and our poſterity to diſcover in theſe our regions. For there is ſcarce any where a greater variety of *moſſes*, *lichens*, *fuci*, and *fungi*, than with us; and the moſt curious botaniſts are now diligently employed in contemplating theſe minute plants.

Whoever beheld, or deſcribed our *diapenſia?* who the *blaſia* unleſs Micheli alone? Theſe two kinds of plants grow with us, and the latter eſpecially is found in great plenty about Fahluna. What traveller, that is not totally ignorant in botany, does not go from Paris to Fontainebleau to ſee thoſe very rare *orchis's*, ſome of which repreſent helmets, others knats, others flies; all of them ſo exactly, ſo wonderfully, that there ſeems nothing

wanting to make them the very animals themſelves, but noiſe, and motion? Who imagined theſe flowers grew in our countrey, and in ſuch plenty in Oeland, that they are to be met with in every field?

Who would ever have thought of looking in our countrey for the following exotics? The *winged pea*, the *great burnet*, the *perennial lettuce*, the *dwarf carline thiſtle*, the *middle fleabane*, the *black hellebore*, the Illyric *crowfoot*, much leſs the *riccia*, and herb *terrible*, and eſpecially the *ſcorpion ſena*, that moſt beautiful ſhrub, which in winter is carefully guarded againſt the froſts in the ſtoves of our botaniſts; yet all theſe have lately been obſerved to grow in Oeland and Gothland.

We uſed to purchaſe at a great price from forreigners the following medicinal plants, *vervain*, *moneywort*, &c. which all are natives of Sweden, and yet ten years ago nobody knew this.

What expences have we been at yearly to get the *glaſs-wort*, of whoſe aſhes and ſalt, glaſs is made. The *dyers weed* and *woad* were purchaſed yearly at a very high price; plants that we have at laſt found grow every where about our provinces.

Lapland

Lapland alone furniſhed me ſome time ago with a hundred rare plants. I have gathered lately as many in the iſlands of the Baltic, and in Scania as many more, never before obſerved in Sweden. Nor can it be doubted, but that our other provinces conceal in their unfrequented corners other new plants, valuable for uſe or beauty, tho' hitherto overlooked, if a diligent and acute inquirer be not wanting. I will not ſay with the poet, "Happy the rural inhabitant," but "happy "the Swediſh inhabitant if he knew but what "good he is poſſeſſed of [b]."

The zoologiſt will no where meet with a place more delightful, and more ſuitable to his views, than that where flocks of all kinds of birds in ſpring time, and ſummer, gather

[b] Our countrey has been ſearched by ſo many able botaniſts for plants, that what is ſaid here cannot be applied to us. But a curious traveller might be of great ſervice in relation to plants even here, by obſerving and making generally known what plants are peculiarly cultivated in ſome countries. Thus for inſtance they ſow *lotus*. 13. Linn. *birds-foot trefoil, Ray ſyn.* 334. in Herefordſhire, which grows all over England on dry paſtures, and is found very good for ſheep, tho' every where elſe, as far as i know, neglected. Again they make great uſe of the *common vetch* in Glocesterſhire, chiefly for horſes, feeding them with it upon the ſpot, and eating it up time enough for turneps the ſame year.

together to breed. This is the caſe in the woody and mountainous parts of Sweden, more than in any other ſpot of the earth; the Lapland *plover* called *pago*, the Norland *pied chaffinch*, the Oeland *tringa* called *alwargrim*, the Gothland *duck* called *eider*, the artic *duck* of the iſland Carolina called *torde*, the Ottenbyenſian *cobler's awl* called *ſierfloecha*, the *picus tridactylus* of the Dalecarlians are all more rare in other countries than pheaſants are with us. I may venture to affirm that no country upon the face of the earth abounds more with birds and inſects, than Sweden. Wild *rein-*

others, unknown, undeſcribed, unſeen, in foreign countries. Who ever diſſected, examined, deſcribed thoſe minute *red ſerpents* called *aſps*, or *æſpingar* by the ſouthern Swedes, whoſe bite communicates a deadly poiſon?

It would be tedious were i to deſcend to the ſpecies of inſects. The great Reaumur, who has ſhewn a ſagacity, and accuracy, before him unknown, in examining inſects, upon ſeeing my collection of Swediſh inſects owned ingenuouſly, that my countrey alone contained more ſpecies of thoſe animals, than any other known in the world.

The curious diætetic, whoſe buſineſs it is to inquire into the various ways of living among men, will ſcarcely find any place, where there are ſo many different kinds of food, as here. Here men vary in their food, as they vary in fortune, ſituation, and condition. And what is very remarkable, the inhabitants of this northern world have their peculiar cuſtoms, and rules of eating in every province, and territory. In Lapland they live without corn, or wine, without ſalt, or any made liquor. Water, and fleſh, and preparations of theſe are their only ſuſtenance.

In ſome places the countreyman lives in his ſmoaky, and ſooty ſtove on the [c] *coregonus* when ſtinking; and bread made of the roots of the *calla*, or of the huſks, and beards of grain pounded.

In ſome places they live upon ſtinking *herring*, and *ropy* whey called *ſyra*; in other places on a food called *aſſu*, and *artſau*, and ſtinking *fiſh*; and yet they undergo much labor. In ſome places their food is *turneps*, and their drink made of *juniper berries*. Some live upon *peas*, others on *buck wheat*, others grow fat upon *whale*'s fleſh, to the aſtoniſhment of ſtrangers.

In travelling thro' other countries, you will hardly ever ſee ſo many different ways of living in this reſpect, as in the Swediſh dominions, and where conſequently the diætetic philoſopher may have ſo many opportunities of making his experiments.

The pathologiſt, who inquires into the cauſes of diſtempers, will not loſe his time in travelling into theſe countries; as in every dif-

[c] A general name of fiſhes, ſome ſpecies of which are known in England and Wales, as the *ſchelley*, the *grayling*, the *gwiniad*, &c. Vid. Artedi ichthyolog.

ferent

ferent province men are ſubject to peculiar diſeaſes, which ariſe in a great meaſure from the different kinds of food, that prevail among them. He will no doubt hence be empowered to aſſign the true cauſes; why the Norlander is infected with the ſcurvy, and why the Laplander on the contrary is free from it: why the ſame Laplander is ſubject to thoſe terrible gripes, called by them *ullem*; why the Gothlander is chiefly afflicted with the hypochondriacal colic; why the Weſt-Bothnians, who are more prolific than any other people in our part of the world, loſe moſt of their children in the cradle; why ſo many people are liable to the epilepſy in the territory of Verns, for the cauſe is ſlight in appearance, but very ſingular in its nature.

Why almoſt all the males in Orſobæa dye of conſumptions before the age of 30.

To enumerate all the things which we have particular opportunities of obſerving in relation to theſe affairs in our countrey, would require no ſhort treatiſe.

I am fully perſuaded that it is abſolutely neceſſary for the young phyſician to travel thro' his own countrey, were it only for this reaſon, that relying upon his own ſtrength he might

might daily become more diligent, gain experience, without which there can be no ſkill in phyſic, and bring the art which he profeſſes to ſome degree of perfection. For it happens amongſt us, and perhaps no where ſo frequently, that our common people have confidence in their phyſicians, and run in crouds to conſult any one, that is known to have taken a doctor's degree; in other countries they will ſcarcely truſt a young phyſician with a favorite dog.

By following this courſe, and entering into practice, the young phyſician will perceive, whether medicines, oftentimes celebrated beyond all bounds of moderation, have that effect upon the patient, which we find mentioned in practical books. He will hear of many domeſtic remedies, unknown elſewhere, in uſe among the countrey people, that are looked upon as ſpecifics, and preferred to the moſt coſtly preſcriptions; for during the conſultation, the patient may reveal the ſecret, if the phyſician is prudent, and makes uſe of a little art.

What are thoſe famous exotic remedies brought from either Indies, and purchaſed at ſo great a price. v. g. *ſarſaparilla*, a

ſpe-

ſpecies of *ſmilax*, *ipecacuanha*, a ſpecies of *honey-ſuckle*, *acmella*, a ſpecies of *hemp agrimony*, *contrayerva* of *dorſtenia*, and *ſimoruba* of *piſtacia*, which in ſome diſeaſes are reckoned ſpecifics? what are all theſe, i ſay, but remedies approved by long uſe amongſt the vulgar? and are not innumerable remedies uſed among our own countrey people of the ſame nature? were not all thoſe i have enumerated found out by [d] barbarians, and when experience had ſhewn, that they were uſeful, and efficacious in many diſeaſes, were they not thought worthy to be communicated to the reſt of mankind? Let our young phyſician then learn,

[d] Vid. *Vires plantarum Amœnitat. academ.* vol. i. p. 403. where Brunnerus is quoted for ſaying, that barbarians have done more towards the advancement of phyſic, than the learned of all ages. In the ſame paſſage the following words of Tournefort are quoted, *que tout le travail des hommes n'a encore rien produit de ſi aſſuré que deux ou trois drogues que les ſauvages trouvent dans les bois.* The author ſubjoins to theſe quotations a liſt of twenty medicines with an &c. taken from barbarous nations, now uſed in our ſhops.

The curious reader may find in Dampier's voyages a very extraordinary inſtance of the ſkill of the ſavages of America in the chirurgical way. Wafer there gives an account of a cure performed upon himſelf by theſe people, and his teſtimony is the ſtronger, as he was a ſurgeon himſelf.

not

not to contemn, but accurately to remark thoſe remedies, which are cried up amongſt the common people. For he who boaſts of knowing more of the virtues of ſimples, than what [e] taſte, ſmell, [f] fructification, and experiments will ſuggeſt, vehemently deceives, or is deceived.

Ye who intend one of theſe days to cultivate your native ſoil with advantage, and profit, may be aſſured that you will find nothing in all the books of huſbandry, that will be of ſuch aſſiſtance to you in that art, as travelling thro' the different provinces of this kingdom. In ſome parts, and thoſe the moſt barren, you

[e] Vid. *Amænit. academ.* vol. 2. p. 371. in an expreſs treatiſe on this ſubject the author quotes ſeveral eminent phyſicians both ancient and modern, who maintained the ſame opinion as to taſtes. And vol. 3. p. 183. where the aſſiſtance to be had from ſmell is conſidered, and the effects of odors amply treated on.

[f] Fructification. The reader perhaps may be at a loſs to underſtand this. The meaning of it is, that plants which agree in the genus and even in the claſs agree alſo in their vertues. Thus the leaves of all the graſſes are good for cattle, the leſſer ſeeds for ſmall birds, the greater for man, and this without exception. The ſtellated plants of Ray are diuretic, the rough-leaved plants of the ſame author are aſtringent and vulnerary. Plants with a pea-flower are all wholeſome for cattle and man, &c. Vid. a curious treatiſe on this ſubject, in the *Academ.* vol. 1. p. 389.

will

will ſee very conſiderable crops produced by the force of ſkill, and induſtry. In others, tho' by nature extremely fertile, you will ſcarcely ſee any appearance of crops; and the inhabitants live poorly, and in a miſerable condition, merely from careleſſneſs, and indolence. You may obſerve how far the Cuprimontani exceed all others in the management of hay, and graſs, and the Gothlanders, in relation to cattle, and particularly ſheep.

You will have an opportunity of noting the different ways in different places of ploughing, manuring, harrowing, ſowing, reaping, gathering, drying, and threſhing, from whence a prudent traveller may judge which way is beſt.

It would be abſurd indeed to apply to our lands forreign methods of huſbandry in every particular, v. g. forreign graſs ſeed would not ſucceed ſo well as our own. Yet i will venture to ſay one could ſcarcely travel a day in any of our countries without learning ſomething of uſe in œconomy. Many things that will occur, may appear trifling at firſt ſight, which yet upon a more mature conſideration, you will own may be turned to very great advantage; ſuch as the various ways of cloathing, preparing victuals,

tuals, feeding cattle, not to mention the manners, commerce and numberleſs other particulars.

Laſtly, however neceſſary and incumbent upon us it may be to take a view of our countrey, it will be in vain to undergo this trouble, if we do not lay the foundation of our ſtudies at the univerſity, as to natural philoſophy, natural, and medical hiſtory; without which preparation for travelling to advantage every thing that occurs, will appear trite, common, and not worth our attention. The traveller however, above all men, ought to keep in mind that famous principle of Deſcartes, viz. to doubt about every thing. He muſt alſo be very cautious not to ſuffer his mind, from too eager a deſire of knowledge, to be overwhelmed at the beginning by the number of things to be obſerved[s]. * * *

and conjugal tyes have engroſſed our affections.

When by this method you have laid the firſt foundation of travelling in your own countrey, you will then be qualified to go farther, and become ſerviceable to yourſelves, and the public, by learning thoſe things abroad, which could not be learned at home; and thus, having made a fair examination, you may be enabled to judge, whether our own cuſtoms may be improved by the help of forreign ones, and how far; and thus you will not be apt raſhly to imagine, that every faſhion which prevails at Paris, is fit to be introduced into our cottages; laſtly, thus you will not be better acquainted with the manners and cuſtoms in France, England, Germany, and other countries, than with thoſe of your own; i. e. you will not, as the proverb ſays, for want of common ſenſe,

Invert all order, and become
Lynxes abroad, mere moles at home.

But not to abuſe your patience any longer, i here break off the thread of my diſcourſe, that what time remains may be employed by me in expreſſing my wiſhes and thanks. Firſt, to thee, O omnipotent God, i humbly offer

up

up my thankſgiving for the immenſe benefits, that have been heaped upon me thro' thy gracious protection and providence. Thou from my youth upwards haſt ſo led me by the hand, haſt ſo directed my footſteps, that i have grown up in the ſimplicity, and innocence of life, and in the moſt ardent purſuit after knowledge. I give thee thanks for that thou haſt ever preſerved me in all my journies thro' my native and forreign countries, amidſt ſo many dangers, that ſurrounded me on every ſide. That in the reſt of my life, amidſt the heavieſt burthens of poverty, and other inconveniences, thou waſt always preſent to ſupport me with thy almighty aſſiſtance. Laſtly that amidſt ſo many viciſſitudes of fortune, to which i have been expoſed, amongſt all the goods, i ſay, and evils, the joyfull and gloomy, the pleaſing, and diſagreeable circumſtances of life, thou endowedſt me with an equal, conſtant, manly, and ſuperior ſpirit on every occaſion.

To our moſt auguſt, and potent prince Frederick the firſt, as becomes a dutifull, and obedient ſubject, i give moſt humble thanks for his favorable kindneſs in beſtowing upon me this honorable poſt. May the almighty grant, that his majeſty, and his moſt ſerene conſort,

thoſe ſhining ſtars of the north, may long, very long illuminate, and adorn this region with the brightneſs of their rays.

To thee, moſt mighty count Gyllenbourg, illuſtrious chancellor of this univerſity, to thee, though abſent, i return the moſt ſincere, and humble thanks for the great, and even endleſs benefits beſtowed upon me; amongſt which, exceeding all number, this muſt not be reckoned the leaſt, that, when i was called hither by this academy, you recommended me in the moſt indulgent manner to our great monarch. It ſhall be my conſtant care that you may never repent of this favor, and by reverence, reſpect, and duty, to teſtify my gratitude to my lateſt breath.

To the moſt reverend the archbiſhop, to the vice-chancellor, to the magnificent rector, and to you illuſtrious and celebrated profeſſors, i return alſo moſt grateful acknowledgments, who honored me by your unanimous votes, and aſſiſted in bringing me to this chair. As this your benevolence laid me under the greateſt obligation to you, to employ every office of regard and friendſhip towards you, ſo by the grace of God i ſhall omit no opportunity of ſhewing i am not unworthy of your favour.

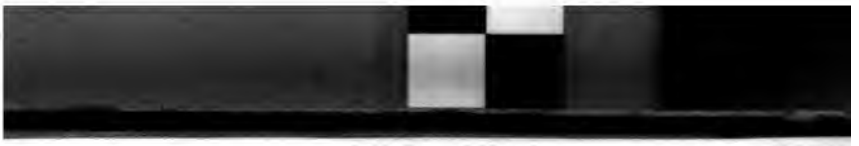
Whilſt i am thus employed in teſtifying the feelings of a grateful mind, i ought not to forget your name, moſt illuſtrious Roberg, my predeceſſor highly worthy of the utmoſt veneration. As i am one of thoſe who have had the happineſs of being educated in your ſchool, i ſhould be the moſt ungratefull of men, if i were ever to ſuffer the remembrance of ſuch a benefit to ſlip out of my mind.

It has been your lot, venerable ſir, to ſurvive all your brethren; and you may juſtly boaſt, what every phyſician now in Sweden will gratefully confeſs, that to you, as to their faithful inſtructor, they owe the beginning, the increaſe, and the finiſhing of their art. Nay not only the faculty at Upſal, but the whole circle here preſent ought to ſalute, and reverence you as ſuperior to them all in age.

Suffer then at laſt your diſciple to eaſe you of that burthen, which for forty years, and more, you have ſuſtained, with honor; that now, time having laid his heavy hand upon you, you may enjoy that reſt, which his ſacred majeſty has kindly granted to your wiſhes. My ſincere prayers are not wanting to the almighty, that he may grant you a chearfull, and vigorous old age, and that every

every thing may ſucceed to the utmoſt of your deſires.

Nor is it fit, ye floriſhing and choſen youth, that on this ſolemn occaſion i ſhould paſs you over in ſilence. I have been long ſenſible of your regard for me, by many and undoubted proofs; i have been long ſenſible, i ſay, and i gratefully acknowledge it. Many of you deſired, ardently deſired to have me in this ſtation, though perhaps never ſeen by you before. For this alone, i know, i am called hither, that i may be uſeful to you. On you therefore my fortune turns. My induſtry, my ſtudies, my labors, my watchings, i willingly, and chearfully conſecrate to your ſervice, and by the aſſiſtance of God, i will exert the utmoſt of my power to ſatisfy your expectations, that you may not be diſappointed in the hopes you have conceived of me.



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THE OECONOMY OF NATURE.

THE OECONOMY OF NATURE.

BY

ISAAC J. BIBERG.

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Æternæ ſunt vices rerum. Sen. nat. 3. 1.

§. 1.

BY the Œconomy of Nature we underſtand the all-wiſe diſpoſition of the Creator in relation to natural things, by which they are fitted to produce general ends, and reciprocal uſes.

All things contained in the compaſs of the univerſe declare, as it were, with one accord the infinite wiſdom of the Creator. For whatever ſtrikes our ſenſes, whatever is the object

of our thoughts, are ſo contrived, that they concur to make manifeſt the divine glory, i. e. the ultimate end which God propoſed in all his works. Whoever duly turns his attention to the things on this our terraqueous globe, muſt neceſſarily confeſs, that they are ſo connected, ſo chained together, that they all aim at the ſame end, and to this end a vaſt number of intermediate ends are ſubſervient. But as the intent of this treatiſe will not ſuffer me to conſider them all, i ſhall at preſent only take notice of ſuch as relate to the preſervation of natural things. In order therefore to perpetuate the eſtabliſhed courſe of nature in a continued ſeries, the divine wiſdom has thought fit, that all living creatures ſhould conſtantly be employed in producing individuals; that all natural things ſhould contribute and lend a helping hand to preſerve every ſpecies; and laſtly, that the death and deſtruction of one thing ſhould always be ſubſervient to the reſtitution of another. It ſeems to me that a greater ſubject than this cannot be found, nor one on which laborious men may more worthily employ their induſtry, or men of genius their penetration.

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I am very ſenſible, being conſcious of my own weakneſs, how vaſt and difficult a ſubject it is, and how unable i am to treat it as it deſerves; a ſubject which would be too great a taſk for the ability of the moſt experienced and ſagacious men, and which properly performed would furniſh materials for large volumes. My deſign therefore is only to give a ſummary view of it, and to ſet forth to the learned world, as far as i am able, whatever curious, worthy to be known, and not obvious to every obſerver occurs in the triple kingdom of nature. Thus if what the induſtry of others ſhall in future times diſcover in this way be added to theſe obſervations, it is to be hoped that a common ſtock may thence grow, and come to be of ſome importance. But before i examine theſe three kingdoms of nature, it will not, i think, be amiſs to ſay ſomething concerning the earth in general, and its changes.

§. 2.

The world, or the terraqueous globe, which we inhabit is every where ſurrounded with elements, and contains in its ſuperficies the three kingdoms of nature, as they are called; the *foſſil*,

ſil, which conſtitutes the cruſt of the earth, the *vegetable*, which adorns the face of it, and draws the greateſt part of its nouriſhment from the *foſſil* kingdom, and the *animal*, which is ſuſtained by the *vegetable* kingdom. Thus theſe three kingdoms cover, adorn and vary the ſuperficies of our earth. It is not my deſign to make any inquiry concerning the center of the terraqueous globe. He, who likes hypotheſes, may conſult Deſcartes, Helmont, Kircher, and others. My buſineſs is to conſider the external parts of it only, and whatever is obvious to the eye.

As to the *ſtrata* of the earth and mountains, as far as we have hitherto been able to diſcover, the upper parts conſiſt of *rag-ſtone*, the next of *ſlate*, the third of *marble* filled with petrifactions, the fourth again with *ſlate*, and laſtly the loweſt of *free-ſtone*. The habitable part of the earth, though it is ſcooped into various inequalities, yet is every where high in compariſon with the water, and the farther it is from the ſea it is generally higher. Thus the waters in the lower places are not at reſt, unleſs ſome obſtacle confines them, and by that means form lakes and marſhes.

The ſea ſurrounds the continent, and takes up the greateſt part of the earth's ſuperficies,

as

as geography informs us. Nay, that it once ſpread over much the greateſt part, we may be convinced by its yearly decreaſe, by the rubbiſh left by the tides, by *ſhells*, *ſtrata*, and other circumſtances.

The ſea-ſhores are uſually full of dead teſtaceous animals, wrack, and ſuch like bodies, which are yearly thrown out of the ſea. They are alſo covered with ſand of various kinds, ſtones, and heaps of other things not very common. It happens moreover, that while the more rapid rivers ruſh through narrow vallies, they wear away the ſides, and thus the friable, and ſoft earth falls in, and its ruins are carried to diſtant, and winding ſhores; whence it is certain, that the continent gains no ſmall increaſe, as the ſea ſubſides.

The clouds collected from exhalations, chiefly from the ſea, but likewiſe from other waters, and moiſt grounds, and condenſed in the lower regions of the atmoſphere, ſupply the earth with rain; but ſince they are attracted by the mountainous parts of the earth, it neceſſarily follows, that thoſe parts muſt have, as is fit, a larger ſhare of water than the reſt. Springs, which generally ruſh out at the foot of mountains, take their riſe from this

this very rain water, and vapours condenſed, that trickle through the holes, and interſtices of looſe bodies, and are received into caverns.

Theſe afford a pure water purged by ſtraining, which rarely dry up in ſummer, or freeze in winter, ſo that animals never want a wholeſome and refreſhing liquor.

The chief ſources of rivers are fountains, and rills growing by gradual ſupplies into ſtill larger and larger ſtreams, till at laſt, after the conflux of a vaſt number of them, they find no ſtop, but falling into the ſea with leſſened rapidity, they there depoſit the united ſtores they have gathered, along with foreign matter, and ſuch earthy ſubſtances, as they tore off in their way. Thus the water returns in a circle, whence it firſt drew its origin, that it may act over the ſame ſcene again.

Marſhes ariſing from water retained in low grounds are filled with moſſy tumps, which are brought down by the water from the higher parts, or are produced by putrified plants.

We often ſee new meadows ariſe from marſhes dryed up. This happens ſooner when the [g] *ſphagnum* F. S. 864. * has laid a founda-

[g] A kind of moſs.

* This refers to the firſt Edition of the *Flora Succica*. It is 958 in the ſecond Edition.

tion ;

tion; for this in proceſs of time changes into a very porous mould, till almoſt the whole marſh is filled with it. After that the *ruſh* ſtrikes root, and along with the *cotton graſſes* conſtitutes a turf, raiſed in ſuch a manner, that the roots get continually higher, and thus lay a more firm foundation for other plants, till the whole marſh is changed into a fine and delightfull meadow; eſpecially if the water happens to work itſelf a new paſſage.

Hillocks, that abound in low grounds, occaſion the earth to encreaſe yearly, more than the countreyman would wiſh, and ſeem to do hurt: but in this the great induſtry of nature deſerves to be taken notice of. For by this means the barren ſpots become ſooner rich meadow, and paſture land. Theſe hillocks are formed by the ant, by ſtones, and roots, and the trampling of cattle; but the principal cauſe is the force of the winter cold, which in the ſpring raiſes the roots of plants ſo high above the ground, that being expoſed to the air they grow, and periſh; after which the *golden maidenhairs* fill the vacant places.

Mountains, hills, vallies, and all the inequalities of the earth, though ſome think they take away much from its beauty, are ſo far

from producing ſuch an effect, that on the contrary they give a more pleaſing aſpect, as well as great advantages. For thus the terreſtrial ſuperficies is larger; different kinds of plants thrive better, and are more eaſily watered, and the rain-waters run in continual ſtreams into the ſea, not to mention many other uſes in relation to winds, heat and cold. Alps are the higheſt mountains, that reach to the ſecond region of the air, where trees cannot grow erect. The higher theſe Alps are, the colder they are *cæteris paribus*. Hence the Alps in Sweden, Siberia, Swiſſerland, Peru, Braſil, Armenia, Aſia, Africa, are perpetually covered with ſnow; which becomes almoſt as hard as ice. But, if by chance the ſummer heats be greater than ordinary, ſome part of theſe ſtores melts, and runs through rivers into the lower regions, which by this means are much refreſhed.

It is ſcarcely to be doubted, but that the rocks and ſtones diſperſed over the globe were formed originally in and from the earth; but when torrents of rain have ſoftened, as they eaſily do, the ſoluble earth, and carried it down into the lower parts, we imagine it happens that theſe ſolid, and heavy bodies, being laid

laid bare, ſtick out above the ſurface. We might alſo take notice of the wonderfull effects of the tide, ſuch as we ſee happen from time to time on the ſea-ſhore, which being daily and nightly aſſaulted with repeated blows, at length gives way and breaks off. Hence we ſee in moſt places the rubbiſh of the ſea, and ſhores.

The winter by its froſt prepares the earth, and mould, which thence are broken into very minute particles, and thus, being put into a mouldering ſtate, become more fit for the nouriſhment of plants; nay by its ſnow it covers the ſeeds, and roots of plants, and thus by cold defends them from the force of cold. I muſt add alſo that the piercing froſt of the winter purifies the atmoſphere, and putrid waters, and makes them more wholeſome for animals.

The perpetual ſucceſſion of heat and cold with us renders the ſummers more pleaſing; and though the winter deprives us of many plants and animals, yet the perpetual ſummer within the tropics is not much more agreeable, as it often deſtroys men, and other animals by its immoderate heat; though it muſt be confeſſed

feſſed that thoſe regions abound with moſt exquiſite fruits. Our winters, though very troubleſome to a great part of the globe, on account of their vehement and intenſe cold, yet are leſs hurtfull to the inhabitants of the northern parts, as experience teſtifies. Hence it happens, that we may live very conveniently on every part of the earth, as every different countrey has different advantages from nature.

The ſeaſons, like every thing elſe, have their viciſſitudes, their beginnings, their progreſs, and their end.

The age of man begins from the cradle, pleaſing childhood ſucceeds, then active youth, afterwards manhood firm, ſevere and intent upon ſelf-preſervation, laſtly old age creeps on, debilitates, and at length totally deſtroys our tottering bodies.

The ſeaſons of the year proceed in the ſame way. Spring, the jovial, playfull infancy of all living creatures, repreſents childhood and youth; for then plants ſpread forth their luxuriant flowers, fiſhes exult, birds ſing, every part of nature is intent upon generation. The ſummer, like middle age, exhibits plants, and trees every where cloathed with green; it gives

gives vigor to animals, and plumps them up, fruits then ripen, meadows look cheerfull, every thing is full of life. On the contrary autumn is gloomy, for then the leaves of trees begin to fall, plants to wither, insects to grow torpid, and many animals to retire to their winter quarters. The day proceeds with just such steps, as the year. The morning makes every thing alert, and fit for business; the sun pours forth his ruddy rays, the flowers which had, as it were, slept all night, awake and expand themselves again; the birds with their sonorous voices, and various notes, make the woods ring, meet together in flocks, and sacrifice to Venus. Noon tempts animals into the fields, and pastures; the heat puts them upon indulging their ease, and even necessity obliges them to it. Evening follows, and makes every thing more sluggish; flowers shut up,[h] and animals retire to their lurking

[h] Of such flowers as sleep by night some account is given by Linnæus in Philos. Botan. p. 88. where the curious may also find, p. 274, a list of plants one or other of which shut their flowers at every hour of the day without regard to the weather. One plant is so remarkable for this property, that it is generally known in our countrey by the name of go-to-bed-at-noon. Its botanical name is tragopogon or goat's-beard. See a Dissertation in the Amæn. acad. vol. 4. where this subject is treated at large.

places. Thus the ſpring, the morning, and youth are proper for generation; the ſummer, noon, and manhood are proper for preſervation; and autumn, evening, and old age are not unfitly likened to deſtruction.

§. 3.

The foſſil kingdom.

Propagation.

It is agreed on all hands, that ſtones are not organical bodies, like plants, and animals; and therefore it is as clear that they are not produced from an egg, like the tribes of the other kingdoms. Hence the variety of foſſils is proportionate to the different combinations of coaleſcent particles, and hence the ſpecies in the foſſil kingdom are not ſo diſtinct, as in the other two. Hence alſo the laws of generation in relation to foſſils have been in all ages extremely difficult to explain; and laſtly hence have ariſen ſo many different opinions about them, that it would be endleſs to enumerate them all. We therefore for the preſent will content ourſelves with giving a very few obſervations on this ſubject.

That

That clay is the ſediment of the ſea is ſufficiently proved by obſervation, for which reaſon it is generally found in great plenty along the coaſts.

The journals of ſeamen clearly evince, that a very minute ſand covers the bottom of the ſea, nor can it be doubted, but that it is daily cryſtalliſed out of the water.

It is now acknowledged by all, that teſtaceous bodies and petrifactions reſembling plants were once real animals or vegetables;[i] and it ſeems likely that ſhells being of a calcareous nature have changed the adjacent clay, ſand, or mould into the ſame kind of ſubſtance. Hence we may be certain, that marble may be generated from petrifactions, and therefore it is frequently ſeen full of them.

Rag-ſtone the moſt common matter of our rocks appears to be formed from a ſandy kind of clay, but this happens more frequently, where the earth is impregnated with iron.

Freeſtone is the product of ſand, and the deeper the bed, where it is found, the more compact it becomes; and the more denſe the

[i] I have taken the liberty not to follow the original text in this place. The learned will ſee the reaſon at firſt ſight.

ſand, the more eaſily it concretes. But if an *alcaline* clay chances to be mixed with the ſand, the *freeſtone* is generated more readily, as in the *freeſtone* called *cos friatilis, particulis argillo-glarenſis*, S. N. 1. 1.

The *flint*, S. N. 3. 1. is almoſt the only kind of *ſtone*, certainly the moſt common in *chalky* mountains. It ſeems therefore to be produced from *chalk*. Whether it can be reduced again to *chalk*, i leave to others to inquire.

Stalactites, S. N. 33. 1. or *drop-ſtone* is compoſed of calcareous particles, adhering to a dry and generally a vegetable body.

The incruſtations S. N. 32. 5, 6, 7, 8. are often generated, where a vitriolic water connects claiey and earthy particles together.

Slate by the vegetables, that are often incloſed in it, ſeems to take its origin from a marſhy mould.

Metals vary according to the nature of the matrix, to which they adhere, e. g. the *pyrites cupri Fahlunenſis* contains frequently *ſulphur, arſenic, iron, copper*, a little *gold, vitriol, alum*, ſometimes *lead ore, ſilver* and *zinck*. Thus *gold, copper, iron, zinck, arſenic, pyrites, vitriol*, come out of the ſame vein. That very rich *iron* ore at Normark in Vermelandia, where it

it was cut tranſverſly by a vein of clay, was changed into a pure *ſilver*. The number therefore of ſpecies, and varieties of *foſſils*, each ſerving for different purpoſes, according to their different natures, will be in proportion, as the different kinds of earths and *ſtones* are variouſly combined.

§. 4.

Preſervation.

As *foſſils* are deſtitute of life, and organiſation, are hard, and not obnoxious to putrefaction; ſo they laſt longer, than any other kind of bodies. How far the air contributes to this duration it is eaſy to perceive, ſince air hardens many *ſtones* upon the ſuperficies of the earth, and makes them more ſolid, compact, and able to reſiſt the injuries of time. Thus it is known from vulgar obſervation that *lime*, that has been long expoſed to the air, becomes hardened. The *chalky marl*, which they uſe in Flanders for building houſes, as long as it continues in the quarry, is friable; but when dug up and expoſed to the air, it grows gradually harder. In the ſame way our old walls, and towers gain a firmneſs in proceſs of time,

tations of the ſea, and lakes, and the vehemence of the waves, excited by turbulent winds pulveriſe *ſtones*, as evidently appears by their roundneſs along the ſhore. Nay as the poet ſays,

The hardeſt ſtone inſenſibly gives way
To the ſoft drops that frequent on it play.

So that we ought not to wonder, that theſe very hard bodies moulder away into powder, and are obnoxious like others to the conſuming tooth of time.

Sand is formed of *freeſtone*, which is deſtroyed partly by froſt, making it friable, partly by the agitation of water, and waves; which eaſily wear away, diſſolve, and reduce into minute particles, what the froſt had made friable.

Chalk is formed of rough *marble*, which the air, the ſun, and the winds have diſſolved, as appears by Iter. Goth. 170.

The *ſlate* earth or *humus ſchiſti* Syſ. Nat. 511. owes its origin to *ſlate*, diſſolved by the air, rain and ſnow.

Ochre is formed of metals diſſolved, whoſe *faeces* preſent the very ſame colours, which we always find the *ore* tinged with, when expoſed to the air. *Vitriol* in the ſame man-

manner mixes with water from *ores* deſtroyed.

The *muria ſanatilis* Syſ. Nat. 14. 6. a kind of talky ſtone yielding ſalt in the parts that are turned to the ſun, is diſſolved into ſand, which falls by little and little upon the earth, till the whole is conſumed; not to mention other kinds of *foſſils*. Laſtly from theſe there are new *foſſils*, as we mentioned before, ſo that the deſtruction of one thing ſerves for the generation of another.

Teſtaceous worms ought not to be paſſed over on this occaſion, for they eat away the hardeſt *rocks*. That ſpecies of *ſhell fiſh* called the *razor ſhell* bores thro' ſtones in Italy, and hides itſelf within them; ſo that the people who eat them are obliged to break the ſtones, before they can come at them. The *cochlea* F. S. 1299. a kind of *ſnail* that lives on craggy *rocks*, eats, and bores through the chalky hills, as worms do through wood. This is made evident by the obſervations of the celebrated de Geer.

§. 6.

§. 6.

The Vegetable Kingdom.

Propagation.

Anatomy abundantly proves, that all *plants* are *organic*, and living bodies; and that all *organic* bodies are propagated from an egg has been ſufficiently demonſtrated by the induſtry of the moderns. We therefore the rather, according to the opinion of the ſkilfull, reject the æquivocal generation of *plants*; and the more ſo, as it is certain that every living thing is produced from an egg. Now the ſeeds of *vegetables* are called eggs; theſe are different in every different *plant*, that the means being the ſame, each may multiply its ſpecies, and produce an offspring like its parent. We do not deny, that very many *plants* puſh forth from their roots freſh offsets for two or more years. Nay not a few *plants* may be propagated by branches, buds, ſuckers and leaves fixed in the ground, as likewiſe many trees. Hence their ſtems being divided into branches, may be looked on as roots above ground; for in the ſame way the roots creep under ground;

and divide into branches. And there is the more reaſon for thinking ſo, becauſe we know that a tree will grow in an inverted ſituation, viz. the roots being placed upwards, and the head downwards, and buried in the ground; for then the branches will become roots, and the roots will produce leaves and flowers. The *lime-tree* will ſerve for an example, on which gardeners have chiefly made the experiment. Yet this by no means overturns the doctrine, that all *vegetables* are propagated by ſeeds; ſince it is clear that in each of the foregoing inſtances nothing vegetates but what was part of a plant, formerly produced from ſeed, ſo that, accurately ſpeaking, without ſeed no new *plant* is produced.

Thus again plants produce ſeeds, but they are entirely unfit for propagation, unleſs fœcundation precedes, which is performed by an intercourſe between different ſexes, as experience teſtifies. *Plants* therefore muſt be provided with *organs* of generation; in which reſpect they hold an analogy with *animals*. Since in every *plant* the flower always precedes the fruit, and the fœcundated ſeeds viſibly ariſe from the fruit; it is evident that the *organs* of generation are contained in the flower, which

which *organs* are called *antheræ*, and *ſtigmata*, and that the impregnation is accompliſhed within the flower. This impregnation is performed by means of the duſt of the *antheræ* falling upon the moiſt *ſtigmata*, where the duſt adheres, is burſt, and ſends forth a very ſubtle matter, which is abſorbed by the *ſtyle*, and is conveyed down to the rudiment of the ſeed, and thus renders it fertile. When this operation is over, the *organs* of generation wither and fall, nay a change in the whole flower enſues. We muſt however obſerve, that in the *vegetable kingdom* one, and the ſame flower does not always contain the *organs* of generation of both ſexes, but oftentimes the male *organs* are on one *plant*, and the female on another. But that the buſineſs of impregnation may go on ſucceſsfully, and that no plant may be deprived of the neceſſary duſt, the whole moſt elegant *apparatus* of the *antheræ* and *ſtigmata* in every flower is contrived with wonderful wiſdom.

For in moſt flowers the *ſtamina* ſurround the *piſtills*, and are about the ſame height; but there are many *plants*, in which the *piſtill* is longer than the *ſtamina*, and in theſe it is wonderful to obſerve, that the Creator has

has made the flowers recline, in order that the duſt may more eaſily fall into the *ſtigma*, e. g. in the *campanula*, *cowſlip*[1], &c. But when the fœcundation is compleated the flowers riſe again, that the ſeeds may not fall out before they are ripe, at which time they are diſperſed by the winds. In other flowers on the contrary the *piſtill* is ſhorter, and there the flowers preſerve an erect ſituation, nay when the flowering comes on they become erect; tho' before they were drooping, or immerſed under water. Laſtly, whenever the male flowers are placed below the female ones, the leaves are exceedingly ſmall, and narrow, that they may not hinder the duſt from flying upwards, like ſmoak; as we ſee in the *pine*, *fir*, *yew*, *ſea-grape*, *juniper*, *cypreſs*, &c. and when in one and the ſame ſpecies one plant is male and the other female, and conſequently may be far from one another, there the duſt, without which there is no impregnation, is carried in abundance by the help

[1] This curious phænomenon did not eſcape the poetical eye of Milton, who was ſo very much ſtruck with the beauty of it, that he thought it worth deſcribing in the following enlivened imagery,

With cowſlips *wan that hang the penſive head.*

of

of the wind from the male to the female; as in the whole *dioicous* [m] claſs. Again a more difficult impregnation is compenſated by the longævity of the individuals, and the continuation of life by buds, ſuckers and roots, ſo that we may obſerve every thing moſt wiſely diſpoſed in this affair. Moreover we cannot without admiration obſerve that moſt flowers expand themſelves when the ſun ſhines forth, whereas when clouds, rain, or the evening comes on, they cloſe up, leſt the genital duſt ſhould be coagulated, or rendered uſeleſs, ſo that it cannot be conveyed to the *ſtigmata*. But what is ſtill more remarkable and wonderfull! when the fœcundation is over, the flowers neither upon ſhowers, nor evening coming on cloſe themſelves up. Hence when rain falls in the flowering time, the huſbandman and gardener foretell a ſcarcity of fruits. I could and would illuſtrate all this by many remarkable inſtances, if the ſame ſubject had not lately been explained, in this very place [n] in a manner equal to its

[m] i. e. where one plant bears male flowers, and the other female ones.

[n] I ſuppoſe the author here alludes to a treatiſe publiſhed in Amæn. academ. vol. 1. entitled, *Sponſalia plantarum*, in which are contained ſo many proofs of the reality of the different ſexes of plants, that to me there ſeems to remain no room for doubt.

im-

importance. I cannot help remarking one particular more, viz. that the organs of generation, which in the animal kingdom are by nature generally removed from ſight, in the vegetable are expoſed to the eyes of all, and that when their nuptials are celebrated, it is wonderfull what delight they afford to the ſpectator by their moſt beautiful colours and delicious odors. At this time bees, flies, and other inſects ſuck honey, out of their nectaries, not to mention the humming bird; and that from their effete duſt the bees gather wax.

§. 7.

As to the diſſemination of ſeeds, after they come to maturity, it being abſolutely neceſſary; ſince without it no crop could follow; the Author of nature has wiſely provided for this affair in numberleſs ways. The ſtalks and ſtems favor this purpoſe, for theſe raiſe the fruit above the ground, that the winds, ſhaking them to and fro, may diſperſe far off the ripe ſeeds. Moſt of the [n] *pericarps* are ſhut at

[n] Whatever ſurrounds the ſeeds is called by botanical writers a *pericarpium*, and as we want an Engliſh word to expreſs this, i have taken the liberty to call it a pericarpy.

top,

top, that the ſeeds may not fall, before they are ſhook out by ſtormy winds. Wings are given to many *ſeeds*, by the help of which they fly far from the mother plant, and oftentimes ſpread over a whole countrey. Theſe wings conſiſt either of a down, as in moſt of the compoſite flowered plants, or of a membrane, as in the *birch*, *alder*, *aſh*, &c. Hence *woods*, which happen to be conſumed by fire, or any other accident, will ſoon be reſtored again by new plants, diſſeminated by this means. Many kinds of fruits are endued with a remarkable elaſticity, by the force of which, the ripe *pericarps* throw the *ſeeds* to a great diſtance, as the *wood-ſorrel*, the *ſpurge*, the *phyllanthus*, the *dittany*. Other *ſeeds* or *pericarps* are rough, or provided with hooks; ſo that they are apt to ſtick to animals, that paſs by them, and by this means are carried to their holes where they are both ſown, and manured by nature's wonderfull care; and therefore the plants of theſe *ſeeds* grow, where others will not, as *hounds-tongue*, *agrimony*, &c.

Berries and other *pericarps*, are by nature allotted for aliment to animals, but with this condition, that while they eat the pulp they ſhall ſow their *ſeeds*; for when they feed upon

it they either diſperſe them at the ſame time, or, if they ſwallow them, they are returned with intereſt; for they always come out unhurt. It is not therefore ſurpriſing, that if a field be manured with recent mud or dung not quite rotten, various other plants, injurious to the farmer, ſhould come up along with the grain, that is ſowed. Many have believed that *barley*, or *rye* has been changed into *oats*, altho' all ſuch kinds of metamorphoſes are repugnant to the laws of generation, not conſidering that there is another cauſe of this phænomenon, viz. that the ground perhaps has been manured with horſe-dung, in which the *ſeeds* of *oats*, coming entire from the horſe, lye hid and produce that grain. The *miſletoe* always grows upon other trees, becauſe the thruſh that eats the ſeeds of it, caſts them forth with its dung, and as bird-catchers make their bird-lime of this ſame plant, and daub the branches of trees with it, in order to catch the thruſh, the proverb hence took its riſe;

The thruſh, when he befouls the bough,
Sows for himſelf the ſeeds of woe.

It is not to be doubted, but that the greateſt part of the *junipers* alſo, that fill our woods,

are ſown by thruſhes, and other birds in the ſame manner; as the berries, being heavy, cannot be diſperſed far by the winds. The croſs-bill that lives on the fir-cones, and the hawfinch that feeds on the pine-cones, at the ſame time ſow many of their *ſeeds*, eſpecially when they carry the *cone* to a ſtone, or trunk of a tree, that they more eaſily ſtrip it of its ſcales. Swine likewiſe, by turning up the earth, and moles by throwing up hillocks, prepare the ground for ſeeds in the ſame manner, as the ploughman does.

I paſs over many other things, which might be mentioned concerning the ſea, lakes, and rivers, by the help of which oftentimes *ſeeds* are conveyed unhurt to diſtant countries; nor need I mention in what a variety of other ways nature provides for the diſſemination of plants, as this ſubject has been treated on at large in our illuſtrious preſident's oration concerning the augmentation of the habitable earth. [p]

§. 8.

[p] As there is ſomething very ingenious, and quite new in the treatiſe here referred to, i will for the ſake of thoſe, who cannot read the original, give a ſhort abſtract of it. His deſign is to ſhew that there was only one pair of all living things, created at the beginning. According to the account

§. 8.

Preſervation.

The great Author and Parent of all things, decreed, that the whole earth ſhould be covered with plants, and that no place ſhould be

account of Moſes, ſays the author, we are ſure, that this was the caſe in the human ſpecies; and by the ſame account we are informed that this firſt pair was placed in Eden, and that Adam gave names to all the animals. In order therefore that Adam might be enabled to do this, it was neceſſary that all the ſpecies of animals ſhould be in paradiſe; which could not happen unleſs alſo the ſpecies of vegetables had been there likewiſe. This he proves from the nature of their food, particularly in relation to inſects, moſt of which live upon one plant only. Now had the world been formed in its preſent ſtate, it could not have happened that all the ſpecies of animals ſhould have been there. They muſt have been diſperſed over all the globe, as we find they are at preſent, which he thinks improbable for other reaſons which I ſhall paſs over for the ſake of brevity. To ſolve all the phænomena then he lays down a principle, that at the beginning all the earth was covered with ſea, unleſs one iſland large enough to contain all animals and vegetables. This principle he endeavors to eſtabliſh by ſeveral phænomena which make it probable, that the earth has been and is ſtill gaining upon the ſea, and does not forget to mention *foſſil ſhells*, and *plants* every where found, which he ſays cannot be accounted for by the deluge. He then undertakes to ſhew how

void, none barren. But ſince all countries have not the ſame changes of ſeaſons, and every ſoil is not equally fit for every plant, He therefore, that no place ſhould be without

how all vegetables and animals might in this iſland have a ſoil and climate proper for each, only by ſuppoſing it to be placed under the æquator, and crowned with a very high mountain. For it is well known that the ſame *plants* are found on the Swiſs, the Pyrenean, the Scotch alps, on Olympus, Lebanon, Ida, as on the Lapland and Greenland alps. And Tournefort found at the bottom of mount Ararat the common plants of Armenia, a little way up thoſe of Italy, higher thoſe which grow about Paris, afterwards the Swediſh plants, and laſtly on the top the Lapland *alpine plants*; and i myſelf, adds the author, from the plants growing on the Dalecarlian alps could collect how much lower they were than the alps of Lapland. He then proceeds to ſhew how from one plant of each ſpecies the immenſe number of individuals now exiſting might ariſe. He gives ſome inſtances of the ſurpriſing fertility of certain plants, v. g. the elecampane, one plant of which produced 3000 ſeeds, of ſpelt 2000, of the ſunflower 4000, of the poppy 3200, of tobacco 40320. But ſuppoſing any annual plant producing yearly only two ſeeds, even of this after 20 years there would be 1,048,576 individuals. For they would increaſe yearly in a duple proportion, viz. 2, 4, 8, 16, 32, &c. He then gives ſome inſtances of plants brought from America, that are now become common over many parts of Europe. Laſtly he enters upon the ſubject for which he is quoted in the text, where the detail he gives of the ſeveral methods which nature has taken to propagate vegetables is extremely curious, but too long to inſert in this place.

ſome,

ſome, gave to every one of them ſuch a nature, as might be chiefly adapted to the climate; ſo that ſome of them can bear an intenſe cold, others an equal degree of heat; ſome delight in dry ground, others in moiſt, &c. Hence the ſame plants grow only where there are the ſame ſeaſons of the year, and the ſame ſoil.

The *alpine* plants live only in high, and cold ſituations, and therefore often on the *alps* of Armenia, Switzerland, the Pyreneans, &c. whoſe tops are equally covered with eternal ſnows, as thoſe of the Lapland *alps*, plants of the ſame kind are found, and it would be in vain to ſeek for them any where elſe. It is remarkable in relation to the *alpine* plants, that they blow, and ripen their *ſeeds* very early, otherwiſe the winter would ſteal upon them on a ſudden, and deſtroy them.

Our northern plants, altho' they are extremely rare every where elſe, yet are found in Sibiria, and about Hudſon's bay, as the *arbutus*, *Flor.* 339. *bramble*, 412. *wintergreen*, &c.

Plants impatient of cold live within the torrid zones; hence both the Indies tho' at ſuch a diſtance from one another have plants in com-

mon. The Cape of Good Hope, i know not from what cauſe, produces plants peculiar to itſelf, as all the *meſembryanthema*, and almoſt all the ſpecies of *aloes*. *Graſſes*, the moſt common of all plants, can bear almoſt any temperature of air, in which the good providence of the Creator particularly appears; for all over the globe they above all plants are neceſſary for the nouriſhment of cattle, and the ſame thing is ſeen in relation to our moſt common grains.

Thus neither the ſcorching ſun, nor the pinching cold hinders any countrey from having its vegetables. Nor is there any ſoil, which does not bring forth many kinds of plants; the *pond-weeds*, the *water-lily*, *lobelia* inhabit the waters. The *fluviales*, *fuci*, *conſervæ* cover the bottoms of rivers, and ſea. The *ſphagna* [q] fill the marſhes. The *brya* [r] cloath the plains. The dryeſt woods and places ſcarce ever illuminated by the rays of the ſun are adorned with the *hypna*. Nay ſtones and the trunks of trees are not excepted, for theſe are covered with various kinds of *liverwort*.

The deſart, and moſt ſandy places have their peculiar trees, and plants; and as rivers or

[q] Kind of moſs. [r] Kind of moſs.

brooks

brooks are very ſeldom found there, we cannot without wonder obſerve that many of them diſtill water, and by that means afford the greateſt comfort both to man, and beaſts that travel there. Thus the * *tillandſia*, which is a *paraſitical plant*, and grows on the tops of trees in the deſarts of America, has its leaves turned at the baſe into the ſhape of a pitcher, with the extremity expanded; in theſe the rain is collected, and preſerved for thirſty men, birds, and beaſts.

The *water-tree* in Ceylon produces cylindrical bladders, covered with a lid; into theſe is ſecreted a moſt pure, and refreſhing water, that taſtes like nectar to men, and other animals. There is a kind of *cuckow-pint* in New France, that if you break a branch of it, will afford you a pint of excellent water. How wiſe, how beautiful is the agreement between the plants of every countrey, and its inhabitants, and other circumſtances!

* A kind of *miſſeloe*.

§. 9.

Plants oftentimes by their very ſtructure contribute remarkably both to their own preſervation, and that of others. But the wiſdom of the Creator appears no where more than in the manner of growth of *trees*. For as their roots deſcend deeper, than thoſe of other *plants*, proviſion is thereby made, that they ſhall not rob them too much of nouriſhment; and what is ſtill more, a ſtem not above a ſpan in diameter often ſhoots up its branches very high; theſe bear perhaps many thouſand buds, each of which is a *plant* with its *leaves*, *flowers* and *ſtipulæ*. Now if all theſe grew upon the plain, they would take up a thouſand times as much ſpace, as the *tree* does, and in this caſe there would ſcarcely be room in all the earth for ſo many *plants*, as at preſent the *trees* alone afford. Beſides *plants* that ſhoot up in this way are more eaſily preſerved from cattle by a natural defence, and farther their leaves falling in autumn cover the *plants* growing about againſt the rigor of the winter, and in the ſummer they afford a pleaſing ſhade, not only to animals, but to *plants*, againſt the intenſe heat of the ſun. We may add that

trees

trees like all other *vegetables* imbibe the water from the earth, which water does not circulate again to the root, as the ancients imagined [1]; but being diſperſed, like ſmall rain, by the tranſpiration of the leaves, moiſtens the *plants* that grow about. Again, many *trees* bear fleſhy fruits of the *berry* or *apple* kind, which, being ſecure from the attack of cattle, grow ripe for the uſe of man and other animals, while their ſeeds are diſperſed up and down after digeſtion. Laſtly the particular ſtructure of *trees* contributes very much to the propagation of inſects; for theſe chiefly lay their eggs upon their leaves, where they are ſecure from the reach of cattle.

Ever-green trees, and *ſhrubs* with us are chiefly found in the moſt barren woods, that they may be a ſhelter to animals in the winter. They loſe their leaves every third year, as their ſeeds are ſufficiently guarded by the *moſſes*, and do not want any other covering. The *palms* in the hot countries perpetually keep their leaves, for there the ſeeds ſtand in no need of any ſhelter whatever.

[1] See *Vegetable Statics* by that great philoſopher, Dr. Hales, where this ſubject is treated in a maſterly way.

Many

Many *plants*, and *ſhrubs* are armed with thorns, e. g. the *buck-thorn*, *ſloe*, *carduus*, *cotton-thiſtle*, &c. that they may keep off the animals, which otherwiſe would deſtroy their fruit. Theſe at the ſame time cover many other *plants*, eſpecially of the annual kind, under their branches [u]. So that while the adjacent grounds are robbed of all *plants* by the voracity of animals, ſome may be preſerved, to ripen flowers and fruit, and ſtock the parts about with ſeeds, which otherwiſe would be quite extirpated.

All *herbs* cover the ground with their leaves, and by their ſhade hinder it from being totally deprived of that moiſture, which is neceſſary to their nouriſhment. They are moreover an ornament to the earth, eſpecially as leaves have a more agreeable verdure on the upper, than the under ſide.

The *moſſes*, which adorn the moſt barren places, at the ſame time preſerve the leſſer plants, when they begin to ſhoot, from cold and drought. As we find by experience in our

[u] This obſervation may be extended farther; for it is conſtantly ſeen upon commons, where *furze* grows, that wherever there was a buſh left untouched for years by the commoners, ſome *tree* has ſprung up, being ſecured by the prickles of that *ſhrub* from the bite of the cattle.

gar-

gardens, that *plants* are preſerved in the ſame way. They alſo hinder the fermenting earth from forcing the roots of *plants* upwards in the ſpring; as we ſee happen annually to trunks of trees, and other things put into the ground. Hence very few *moſſes* grow in the warmer climates, as not being ſo neceſſary to that end in thoſe places.

The Engliſh *ſea mat-weed* or *marran* will bear no ſoil but pure ſand, which nature has allotted to it. Sand the produce of the ſea, is blown by winds oftentimes to very remote parts, and deluges, as it were, woods and fields. But where this graſs grows, it frequently fixes the ſand, gathers it into hillocks, and thrives ſo much, that by means of this alone, at laſt an entire hill of ſand is raiſed. Thus the ſand is kept in bounds, other *plants* are preſerved free from it, the ground is increaſed *,

* This obſervation is found in Linn. Flor. Lapp. p. 62, where he ſays the Dutch ſow this graſs on their ſand banks, that the ſand may not overwhelm the neighboring parts. I do not ſee why this experiment ſhould not be tryed on the barren ſands in Norfolk, where i am aſſured by credible witneſſes, that the ſmall cottages are ſometimes totally buried under ſand during high winds. This graſs grows plentifully along the ſea ſhores in England. Vid. Ray, 393. 1.

and the ſea repelled by this wonderful diſpoſition of nature.

How ſolicitous nature is about the preſervation of graſſes is abundantly evident from hence, that the more the leaves of the perennial graſſes are eaten, the more they creep by the roots, and ſend forth off-ſets. For the Author of nature intended, that *vegetables* of this kind, which have very ſlender, and erect leaves, ſhould be copious, and very thick-ſet, covering the ground like a carpet; and thus afford food ſufficient for ſo vaſt a quantity of grazing animals. But what chiefly increaſes our wonder is, that although the graſſes are

times prepared a place for them. Hence always more ſpecies of *plants* appear in thoſe places where this caterpillar has laid waſte the paſtures the preceding year, than at any other time.

§. 10.

Deſtruction.

Daily experience teaches us, that all *plants* as well as all other living things, muſt ſubmit to death.

They ſpring up, they grow, they floriſh, they ripen their fruit, they wither, and at laſt, having finiſhed their courſe, they die, and return to the duſt again, from whence they firſt took their riſe. Thus all black mould, which every where covers the earth, for the greateſt part is owing to dead *vegetables*. For all roots deſcend into the ſand by their branches, and after a *plant* has loſt its ſtem the root remains; but this too rots at laſt, and changes into mould. By this means this kind of earth is mixed with ſand, by the contrivance of nature, nearly in the ſame way as dung thrown upon fields is wrought into the earth by the induſtry of the huſbandman. The earth thus

prepared offers again to *plants* from its bo-ſom, what it has received from them. For when ſeeds are committed to the earth, they draw to themſelves, accommodate to their nature, and turn into *plants*, the more ſub-tile parts of this mould by the co-operation of the ſun, air, clouds, rains, and winds; ſo that the talleſt tree is, properly ſpeaking, no-thing but mould wonderfully compounded with air, and water, and modified by a ver-tue communicated to a ſmall ſeed by the Creator. From theſe plants, when they die, juſt the ſame kind of mould is formed, as gave birth to them originally; but in ſuch a manner, that it is in greater quantity than before. *Vegetables* therefore increaſe the black mould, whence fertility remains continual-ly uninterrupted. Whereas the earth could not make good its annual conſumption, un-leſs it were conſtantly recruited by new ſup-plies.

The cruſtaceous *liverworts* are the firſt foun-dation of *vegetation*, and therefore are *plants* of the utmoſt conſequence in the œconomy of nature, though ſo deſpiſed by us. When rocks firſt emerge out of the ſea, they are ſo poliſhed by the force of the waves, that

ſcarce

ſcarce any herb can find a fixed habitation upon them; as we may obſerve every where near the ſea. But the very minute cruſtaceous *liverworts* begin ſoon to cover theſe dry rocks, although they have no other nouriſhment, but that ſmall quantity of mould, and imperceptible particles, which the rain and air bring thither. Theſe *liverworts* dying at laſt turn into a very fine earth; on this earth the * imbricated *liverworts* find a bed to ſtrike their roots in. Theſe alſo dye after a time, and turn to mould; and then the various kinds of moſſes, e. g. the *hypna*, the *brya*, *politricha* find a proper place, and nouriſhment. Laſtly, theſe dying in their turn, and rotting afford ſuch a plenty of new formed mould, that herbs and ſhrubs eaſily root, and live upon it.

That trees when they are dry or are cut down may not remain uſeleſs to the world, and lye, as it were, melancholy ſpectacles, nature haſtens on their deſtruction in a ſingular way: firſt the *liverworts* begin to ſtrike root in them; afterwards the moiſture is drawn out of them;

* I have uſed this word becauſe we have no Engliſh one of the ſame meaning unleſs it be the word *ſcaly*, that I know of. However imbricated means parts lying over parts like tiles, as in the cup of the *thiſtle flower*.

whence

whence putrefaction follows. Then the *muſh-room* kinds find a fit place for nouriſhment on them, and corrupt them ſtill more. The *beetle* called the *dermeſtes*, next makes himſelf a way between the bark and the wood. The *muſk-beetle*, the *copper talc beetle*, and the *caterpillar* or *coſſus* 812. bores an infinite number of holes through the trunk. Laſtly the *wood-peckers* come, and while they are ſeeking for inſects, wear away the tree, already corrupted; till the whole paſſes into earth. Such induſtry does nature uſe to deſtroy the trunk of a tree! Nay trees immerſed in water would ſcarcely ever be deſtroyed, were it not for the worm that eats ſhips, which performs this work; as the ſailor knows by ſad experience.

Thiſtles, as the moſt uſefull of plants, are armed and guarded by nature herſelf. Suppoſe there were a heap of clay, on which for many years no plant has ſprung up; let the ſeeds of the *thiſtle* blow there, and grow, the *thiſtles* by their leaves attract the moiſture out of the air, ſend it into the clay by means of their roots, will thrive themſelves, and afford a ſhade. Let now other plants come hither, and they will ſoon cover the ground. St. Bielke.

All

All ſucculent plants make ground fine, of a good quality, and in great plenty, as *ſedum*, *craſſula*, *aloe*, *algæ*[y]. But dry plants make it more barren, as *ling* or *heath*, *pines*, *moſs*; and therefore nature has placed the ſucculent plants on rocks, and the dryeſt hills.

§. 11.

The animal kingdom.

Propagation.

The generation of animals holds the firſt place among all things, that raiſe our admiration, when we conſider the works of the Creator; and that appointment particularly, by which he has regulated the conception of the *fœtus*, and its excluſion, that it ſhould be adapted to the diſpoſition, and way of living of each animal, is moſt worthy of our attention.

We find no ſpecies of animals exempt from the ſtings of love, which is put into them to the end, that the Creator's mandate may be executed, *increaſe and multiply*; and that thus

[y] A kind of *graſs wrack*.

the egg, in which is contained the rudiment of the *fœtus* may be fœcundated; for without fœcundation all eggs are unfit to produce an offspring.

Foxes and *wolves*, ſtruck with theſe ſtings, every where howl in the woods; crowds of *dogs* follow the female: *bulls* ſhew a terrible countenance, and very different from that of *oxen*. *Stags* every year have new horns, which they loſe after rutting time. Birds look more beautifull than ordinary, and warble all day long through laſciviouſneſs. Thus *ſmall birds* labour to outſing one another, and *cocks* to outcrow. *Peacocks* ſpread forth again their gay, and glorious trains. *Fiſhes* gather together, and exult in the water; and *graſhoppers* chirp, and pipe as it were, amongſt the herbs. The *ants* gather again into colonies, and repair to their citadels*. I paſs over many other particulars, which this ſubject affords, to avoid prolixity.

* See this ſubject treated with great ſpirit in Thomſon's Spring and in Virgil's Georgics.

§. 12.

The fœcundated egg requires a certain, and proportionate degree of heat for the expanſion of the *ſtamina* of the *embryo*. That this may be obtained, nature operates in different manners, and therefore we find in different claſſes of animals a different way of excluding the *fœtus*.

The females of *quadrupeds* have an *uterus*, contrived for eaſy geſtation, temperate and cheriſhing warmth, and proper nouriſhment of the *fœtus*, as moſt of them live upon the earth, and are there fed.

Birds, in order to get ſubſiſtence, and for other reaſons, are under a neceſſity of ſhifting place: and that not upon their feet but wings. Geſtation therefore would be burthenſome to them. For this reaſon they lay eggs, covered with a hard ſhell. Theſe they ſit upon by a natural inſtinct, and cheriſh till the young one comes forth.

The *oſtrich* and *caſſowary* are almoſt the only birds, that do not obſerve this law; theſe commit their eggs to the ſand, where the intenſe heat of the ſun excludes the *fœtus*.

Fiſhes inhabit cold waters, and moſt of them have cold blood; whence it happens that they have not heat ſufficient to produce the *fœtus*. The all-wiſe Creator therefore has ordained, that moſt of them ſhould lay their eggs upon the ſhore; where, by means of the ſolar rays, the water is warmer, and alſo fitter for that purpoſe; becauſe it is there leſs impregnated with ſalt, and conſequently milder; and alſo becauſe water-inſects abound more there, which afford the young fry a nouriſhment.

Salmons in the like manner, when they are about to lay their eggs, are led by inſtinct to go up the ſtream, where the water is freſh and more pure.

The *butterfly fiſh* is an exception, for that brings forth its *fœtus* alive.

The *fiſhes of the ocean*, which cannot reach the ſhores by reaſon of the diſtance, are alſo exempt from this law. The Author of nature to this kind has given eggs that ſwim: ſo that they are hatched amidſt the ſwimming *fucus*, called *ſargazo*. Flor. Zeilon. 389.

The *cetaceous* fiſh have warm blood, and therefore they bring forth their young alive, and ſuckle them with their teats.

Many

Many *amphibious* animals bring forth live *fœtuſes*. As the *viper*, and the *toad*, &c. But the ſpecies that lay eggs, lay them in places, where the heat of the ſun ſupplies the warmth of the parent.

Thus the reſt of the *frog* kind and the *lizard* kind, lay their eggs in warm waters; the common *ſnake* in dunghills, and ſuch-like warm places, and give them up to nature, as a provident nurſe to take care of them. The *crocodile*, and *ſea tortoiſes* go aſhore to lay their eggs under the ſand, where the heat of the ſun hatches them.

Moſt of the *inſect* kind neither bear young nor hatch eggs; yet their tribes are the moſt numerous of all living creatures; inſomuch that if the bulk of their bodies were proportionate to their quantity, they would ſcarce leave room for any other kind of animals. Let us ſee therefore with what wiſdom the Creator has managed about the propagation of theſe minute creatures. The females by natural inſtinct meet and copulate with the males; and afterwards lay their eggs; but not indiſcriminately in every place; for they all know how to chooſe ſuch places as may ſupply their offſpring in its tender age with nouriſhment, and

other things neceſſary to ſatisfy their natural wants; for the mother, ſoon after ſhe has laid her eggs, dyes, and were ſhe to live ſhe would not have it in her power to take care of her young.

Butterflies, *moths*, ſome *beetles*, *wevils*, *bugs*, *cuckow-ſpit inſects*, *gall-inſects*, *tree bugs*, &c. lay their eggs on the leaves of plants, and every different tribe chooſes its own ſpecies of plant *. Nay there is ſcarce any plant, which does not afford nouriſhment to ſome inſect; and ſtill more, there is ſcarcely any part of a plant, which is not preferred by ſome of them. Thus one inſect feeds upon the flower; another upon the trunk: another upon the root; and another upon the leaves. But we cannot help wondering particularly, when we ſee how the leaves of ſome trees, and plants, after eggs have been let into them, grow into galls; and form dwellings, as it were, for the young ones, where they may conveniently live. Thus when the *gall inſect* called *cynips*, Fn. 947. has fixed her eggs in the leaves of an oak, the wound of the leaf ſwells, and a knob like an apple ariſes, which includes and nouriſhes the embryo.

* Vid. Syſt. Nat. Edit. 10. Fauna Suecica; and Hoſpita Inſectorum Flora Amæn. Academ. vol. 3.

When

When the *tree-bug*, Faun. Suéc. 700. has depoſited its eggs in the boughs of the fir tree, excreſcences ariſe ſhaped like peas. When another ſpecies of the *tree-bug*, Fn. 695. has depoſited its eggs in the *mouſe-ear chickweed* or the *ſpeedwell*, Fl. 12. the leaves contract in a wonderfull manner into the ſhape of a head. The *water-ſpider*, Fn. 1150. excludes its eggs either on the extremities of the *juniper*, which from thence forms a lodging, that looks like the *arrow-headed graſs*, or on the leaves of the *poplar*, from whence a red globe is produced. The *tree-louſe*, Fn. 1355. lays its eggs on the leaves of black poplar, Fl. 821. which from thence turn into a kind of inflated bag, and ſo in other inſtances. Nor is it upon plants only that inſects live, and lay their eggs. The *knats*, Fn. 1116. commit theirs to ſtagnating waters. The water inſect called *monoculus*, Fn. 1182. often increaſes ſo immenſely on pools, that the red legions of them have the appearance of blood. Others lay their eggs in other places, e. g. the *beetle* in dunghills. The *dermeſtes* in ſkins. The *fleſh fly* in putrified fleſh. The *cheeſe-maggot* in the cracks of cheeſe, from whence the *caterpillars* iſſuing forth oftentimes conſume the whole cheeſe,

and deceive many people, who fancy the worms are produced from the particles of the cheeſe itſelf, by a generation called æquivocal, which is extremely abſurd. Others exclude their eggs upon certain animals. The *mill-beetle* Fn. 618. lays its eggs between the ſcales of fiſhes. The *ſpecies of glad-fly* Fn. 1024 on the back of cattle. The *ſpecies* 1025 on the back of the rhen deer. The *ſpecies* 1026 in the noſes of ſheep. The *ſpecies* 1028 lodges during the winter in the inteſtinal tube, or the throat of horſes, nor can it be driven out till the ſummer comes on. Nay *inſects* themſelves are often ſurrounded with the eggs of other inſects, inſomuch that there is ſcarcely an animal to be found, which does not feed its proper inſect, not to ſay any more of all the other places where they depoſit their eggs. Almoſt all the eggs of *inſects*, when laid, are ordained to undergo, by a wonderfull law of nature, various metamorphoſes, e. g. the egg of the *butterfly* being laid in the cabbage firſt of all becomes a *caterpillar*, that feeds upon the plant, crawls, and has ſixteen feet. This afterwards changes into a *nymph*, that has no feet, is ſmooth, and eats nothing; and laſtly this burſts into a *butterfly*, that flies, has variety of colours, is rough,

and

and lives upon honey. What can be more worthy of admiration, than that one, and the ſame animal ſhould appear on the ſtage of life under ſo many characters, as if it were three diſtinct animals [a].

The laws of generation of *worms* are ſtill very obſcure, as we find they are ſometimes produced by eggs, ſometimes by offsets, juſt in the ſame manner as happens to trees. It has been obſerved with the greateſt admiration, that the *polypus* or *hydra* S. N. 221. lets down ſhoots and live branches, by which it is multiplied. Nay more, if it be cut into many parts, each ſegment, put into the water, grows into a perfect animal; ſo that the parts which were torn off are reſtored from one ſcrap.

§. 13.

The multiplication of animals is not tyed down to the ſame rules in all; for ſome have a remarkable power of propagating, others are

[a] Linnæus Amæn. academ. vol. 2. in a treatiſe on the wonders relating to inſects, ſays, "as ſurpriſing as theſe "transformations may ſeem, yet much the ſame happens "when a chicken is hatched; the only difference is, that "the chicken breaks all three coats at once, the butterfly "one after another."

con-

confined within narrower limits in this reſpect. Yet in general, we find, that nature obſerves this order, that the leaſt animals, and thoſe which are uſefull, and ſerve for nouriſhment to the greateſt number of other animals, are endued with a greater power of propagating than others [b].

Mites, and many other inſects will multiply to a thouſand within the compaſs of a very few days. While the *elephant* ſcarcely produces one young in two years.

The *hawk* kind generally lay not above two eggs, at moſt four, while the *poultry* kind riſe to 50.

The *diver* or *loon*, which is eaten by few animals, lays alſo two eggs, but the *duck* kind, the *moor game*, *partridges*, &c. and *ſmall birds* lay a very large number.

If you ſuppoſe two *pigeons* to hatch nine times a year, they may produce in four years 14672 young [c]. They are endued with this

[b] Herodotus ſpeaking of the flying ſerpents in Arabia makes the ſame reflection, and attributes this courſe of nature to the divine providence. Thal.

[c] I have given this paſſage as it ſtands in the original. The numbers ought to have been 14760, or the expreſſion ſhould have been altered; for he includes the firſt pair.

He ſuppoſes it generally known that pigeons hatch but two eggs at a time, and that they pair.

remark-

remarkable fertility, that they may ſerve for food, not only to man, but to hawks and other birds of prey*. Nature has made harmleſs and eſculent animals fruitfull. Plin. Nature has forbid the *bird* kind to fall ſhort of the number of eggs allotted to each ſpecies, and therefore if the eggs which they intend to ſit upon, be taken away a certain number of times, they preſently lay others in their room, as may be ſeen in the ſwallow, duck, and ſmall birds.

§. 14.

Preſervation,

Preſervation follows generation; this appears chiefly in the tender age, while the young are unable to provide for their own ſupport. For then the parents, though otherwiſe ever ſo fierce in their diſpoſition, are affected with a wonderfull tenderneſs or ſenſe of love towards their progeny, and ſpare no pains to provide for, guard, and preſerve them, and that not by an imaginary law, but one given by the Lord of nature himſelf.

Quadrupeds give ſuck to their tender young, and ſupport them by a liquor, perfectly eaſy of digeſtion, till their ſtomachs are able to digeſt,

* Vid. Muſchenbr. Orat. de Sap. Divin.

and

and their teeth are fit to chew more ſolid food. Nay their love toward them is ſo great, that they endeavour to repell with the utmoſt force every thing, which threatens danger, or deſtruction to them. The *ewe* which brings forth two *lambs* at a time, will not admit one to her teats, unleſs the other be preſent, and ſuck alſo; leſt one ſhould famiſh, while the other grows fat.

Birds build their neſts in the moſt artificial manner, and line them as ſoft as poſſible, for fear the eggs ſhould get any damage. Nor do they build promiſcuouſly in any place; but there only, where they may quietly lye concealed, and be ſafe from the attacks of their enemies.

The *hanging bird*, Act. Bonon. vol. 2. makes its neſt of the fibres of withered plants, and the down of the poplar ſeeds, and fixes it upon the bough of ſome tree hanging over the water, that it may be out of reach.

The *diver*, Fn. 123. places its ſwimming neſt upon the water itſelf amongſt the ruſhes. I deſignedly paſs over many other inſtances of the like kind.

Again birds ſit on their eggs with ſo much patience, that many of them chooſe to periſh with

with hunger, rather than expoſe the eggs to danger by going to ſeek for food.

The male *rooks* and *crows* at the time of incubation bring food to the females.

Pigeons, *ſmall birds*, and other *birds*, which pair, ſit by turns; but where polygamy prevails, the males ſcarcely take any care of the young.

Moſt of the *duck* kind pluck off their feathers in great quantity, and cover their eggs with them, leſt they ſhould be damaged by the cold, when they quit their neſts for the ſake of food; and when the young are hatched, who knows not how ſolicitous they are in providing for them, till they are able to fly and ſhift for themſelves?

Young *pigeons* would not be able to make uſe of hard ſeeds for nouriſhment, unleſs the parents were to prepare them in their crops, and thence feed them.

The *eagle owl* makes its neſt on the higheſt precipices of mountains, and in the warmeſt ſpot, facing the ſun; that the dead bodies brought there may by the heat melt into a ſoft pulp, and become fit nouriſhment for the young.

The

The *cuckow* lays its eggs in the neſt of other ſmall birds, generally the *wagtail*, [d] or [e] *hedge-ſparrow*, and leaves the incubation, and preſervation of the young to them. But that theſe young, when grown up, degenerate into hawks, and become ſo ungratefull, that they deſtroy their nurſes, is a mere vulgar error, for it is contrary to their nature to eat fleſh.

Amphibious animals, *fiſhes* and *inſects*, which cannot come under the care of their parents, yet owe this to them, that they are put in places, where they eaſily find nouriſhment, as we have obſerved.

[d] This cuſtom of the cuckow is ſo extraordinary, and out of the common courſe of nature, that it would not be credible, were it not for the teſtimony of the moſt knowing and curious natural hiſtorians, ſuch as Ray, Willughby, Geſner, Aldrovandus, Ariſtotle, &c.

Much has been ſaid by the writers on birds about the fate of the young birds, in whoſe neſt the cuckow is hatched, but as i find nothing but mere conjecture, it would not be worth while tranſcribing.

[e] Hedge-ſparrow. Linnæus ſeems to have taken the white-throat for the hedge-ſparrow.

§. 15.

As ſoon as animals come to maturity, and want no longer the care of their parents, they attend with the utmoſt labour, and induſtry, according to the law and œconomy appointed for every ſpecies, to the preſervation of their lives. But that ſo great a number of them, which occur every where, may be ſupported, and a certain and fixed order may be kept up amongſt them, behold the wonderful diſpoſition of the Creator, in aſſigning to each ſpecies certain kinds of food, and in putting limits to their appetites. So that ſome live on particular ſpecies of plants, which particular regions, and ſoils only produce. Some on particular animalcula, others on carcaſes, and ſome even on mud and dung. For this reaſon Providence has ordained, that ſome ſhould ſwim in certain regions of the watery element, others ſhould fly; ſome ſhould inhabit the torrid, the frigid, or the temperate zones, and others ſhould frequent deſarts, mountains, woods, pools or meadows, according as the food proper to their nature is found in ſufficient quantity. By this means there is no terreſtrial tract,

tract, no ſea, no river, no countrey, but what contains, and nouriſhes various kinds of animals. Hence alſo an animal of one kind cannot rob thoſe of another kind of its aliment; which, if it happened, would endanger their lives or health; and thus the world at all times affords nouriſhment to ſo many, and ſo large inhabitants, at the ſame time that nothing which it produces, is uſeleſs or ſuperfluous.

I think it will not be amiſs to produce ſome inſtances, by which it will appear, how providentially the Creator has furniſhed every animal with ſuch cloathing, as is proper for the countrey where they live, and alſo how excellently the ſtructure of their bodies is adapted to their particular way of life; ſo that they ſeem to be deſtined ſolely to the places, where they are found.

Monkies, *elephants*, and *rhinoceroſes* feed upon vegetables, that grow in hot countries, and therefore therein they have their allotted places. When the ſun darts forth its moſt fervid rays, theſe animals are of ſuch a nature, and diſpoſition, that it does them no manner of hurt; nay with the reſt of the inhabitants of thoſe parts they go naked, whereas were

they covered with hairy ſkins, they muſt periſh with heat.

On the contrary the place of the *rhen deer* is fixed in the coldeſt part of Lapland, becauſe their chief food is the *liverwort*, Fl. 980. which grows no where ſo abundantly as there; and where, as the cold is moſt intenſe, the *rhen deer* are cloathed, like the other northern animals, with ſkins filled with the denſeſt hair; by the help of which they eaſily defy the keenneſs of the winter. In like manner the *rough-legged partridge* paſſes its life in the very Lapland alps, feeding upon the ſeeds of the *dwarf birch*, and that they may run up and down ſafely amidſt the ſnow, their feet are feathered.

The *camel* frequents the ſandy, and burning deſarts, in order to get the barren *camel's hay*. Mat. Med. 31. How wiſely has the Creator contrived for him! he is obliged to go thro' the deſarts, where oftentimes no water is found for many miles about. All other animals would periſh with thirſt in ſuch a journey; but the camel can undergo it without ſuffering; for his belly is full of cells, where he reſerves water for many days. It is reported by travellers, that the Arabians, when in travelling they want water, are forced to kill their camels, and take

water out of their bellies, that is perfectly good to drink, and not at all corrupted.

The *pelican* likewiſe lives in deſart, and dry places; and is obliged to build her neſt far from the ſea, in order to procure a greater ſhare of heat to her eggs. She is therefore forced to bring water from afar for herſelf and her young; for which reaſon Providence has furniſhed her with an inſtrument moſt adapted to this purpoſe; v. g. ſhe has a very large bag under her throat, which ſhe fills with a quantity of water ſufficient for many days; and this ſhe pours into the neſt to refreſh her young, and teach them to ſwim. The wild beaſts, lions, and tigers, come to this neſt to quench their thirſt, but do no hurt to the young.

Oxen delight in low grounds, becauſe there the food moſt palatable to them grows.

Sheep prefer naked hills, where they find a particular kind of graſs called the *feſtuca*, Fl. 95. which they love above all things.

Goats climb up the precipices of mountains, that they may browſe on the tender ſhrubs, and in order to fit them for it, they have feet made for jumping*.

* Vid. Derham's Phyſico-Theol. p. 319. not. 7.

Horſes chiefly reſort to woods, and feed upon leafy plants.

Nay, ſo various is the appetite of animals, that there is ſcarcely any plant, which is not choſen by ſome, and left untouched by others. The *horſe* gives up the *water hemlock* to the goat. The *cow* gives up the *long-leaved water hemlock* to the ſheep. The *goat* gives up the *monks-hood* to the horſe, &c. for that which certain animals grow fat upon, others abhor as poiſon. Hence no plant is abſolutely poiſonous, but only reſpectively. Thus the *ſpurge*, that is noxious to man, is a moſt wholeſome nouriſhment to the *caterpillar*, Fn. 825. That animals may not deſtroy themſelves for want of knowing this law, each of them is guarded by ſuch a delicacy of taſte and ſmell, that they can eaſily diſtinguiſh what is pernicious from what is wholeſome; and when it happens that different animals live upon the ſame plants, ſtill one kind always leaves ſomething for the other, as the mouths of all are not equally adapted to lay hold of the graſs; by which means there is ſufficient food for all. To this may be referred an œconomical experiment well known to the Dutch, that when eight cows have been in a paſture, and can no

longer get nouriſhment, two horſes will do very well there for ſome days, and when nothing is left for the horſes, four ſheep will live upon it.

Swine get proviſion by turning up the earth; for there they find the ſucculent roots, which to them are very delicious.

The leaves and fruits of trees are intended as food for ſome animals, as the ſloth[f], the

[f] There is ſo curious an account of this animal in Kircher's Muſurgia, that i think the reader will excuſe my tranſcribing it. That author ſays thus: 'The deſcription 'of this animal i had from father Torus, provincial of the 'Jeſuites in America, who had animals of this kind in 'his poſſeſſion, and made many experiments in relation to 'their nature and qualities. Its figure is extraordinary; 'it is about the bigneſs of a cat, of very ugly countenance, 'and has claws extended like fingers. The hinder part 'of the head and neck are covered with hair. It ſweeps 'the ground with its fat belly, never riſes upon its feet, 'and moves ſo ſlowly, that it would ſcarce go the length 'of a bow-ſhot in 15 days, tho' conſtantly moving, and it 'is therefore called the Sloth. It is not known what it 'feeds upon, not being ever obſerved to take any food. It 'lives generally upon tops of trees, and employs two days 'to crawl up and as many to get down again. Nature has 'doubly guarded this animal againſt its enemies. Firſt by 'giving it ſuch ſtrength in its feet that whatever it ſeizes, 'it holds ſo faſt, that it can never be freed from its claws, 'but muſt there die of hunger. Secondly in giving it ſuch 'a moving

the ſquirrel, and theſe laſt have feet given them fit for climbing.

Beſides myriads of fiſhes, the *caſtor*, the *ſea calf*, and others inhabit the water, that they may there be fed, and their hinder feet are fit for

'a moving aſpect, when it looks at any man who ſhould 'be tempted to hurt it, that it is impoſſible not to be 'touched with compaſſion; beſides that at the ſame time 'it ſheds tears, and upon the whole perſuades one that a 'creature ſo defenceleſs, and of ſo unhappy a body ought 'not to be tormented. To make an experiment of this, 'the abovementioned father procured one of theſe animals 'to be brought to our college at Carthagena. He put a 'long pole under his feet, which it ſeized upon very firmly 'and would not let it go again. The animal therefore 'thus voluntarily ſuſpended was placed between two beams 'along with the pole, and there it remained without meat, 'drink, or ſleep, forty days; its eyes being always fixed 'on people that looked at it, who were ſo touched, that 'they could not forbear pitying it. At laſt being taken 'down they let looſe a dog on it, which after a little while 'the Sloth ſeized with his feet, and held him four 'days, till he died of hunger. This was taken from the 'mouth of the father. They add, continues Kircher, 'that this creature makes no noiſe but at night, but that 'very extraordinary. For by interruptions, that laſt a-'bout the length of a ſigh or ſemipauſe, it goes through 'the ſix vulgar intervals of muſic, ut, re, mi, fa, ſol, la, 'La, ſol, fa, mi, re, ut, aſcending and deſcending, and 'theſe perfectly in tune. So that the Spaniards, when 'they firſt got poſſeſſion of this coaſt, and heard theſe

for ſwimming, and perfectly adapted to their manner of life.

The whole order of the *gooſe* kind, as ducks, merganſer, &c. paſs their lives in water, as feeding upon water-inſects, fiſhes, and their eggs [g]. Who does not ſee, that attends ever ſo little, how exactly the wonderfull for-

[g] notes, imagined that ſome people brought up to our muſic, were ſinging. This animal is called by the natives, Haut, certainly becauſe going thro' theſe muſical intervals, it repeats, Ha, ha, ha, ha, ha, &c.'

This account ſeems very wonderfull, and i leave it as it ſtands without entering into any diſcuſſion about its credibility. I will only add, that Linnæus ſeems in the new edition of the Syſt. Nat. to give credit to it. For he ſays in his ſhort way of deſcription among other things, 'It utters an aſcending hexacord. Its noiſe is horrible, 'its tears piteous.' He quotes Mangrave, Cluſius, Geſner, &c. But not having an opportunity of conſulting theſe books, i cannot tell how far theſe authors confirm the foregoing account; if it be true, it would furniſh ſome obſervations, but this would not be a place for them.

[g] Many opinions, ſays the author in the note, have been ſtarted in order to account how it happens that fiſhes are found in pools, and ditches, on high mountains and elſewhere. But Gmelin obſerves that the *duck* kind ſwallow the eggs of fiſhes, that ſome of theſe eggs go down, and come out of their bodies unhurt, and ſo are propagated juſt in the ſame manner, as has been obſerved of plants. Biberg.

Gmelin adds, that the Sibirians themſelves account for this phænomenon in the manner above mentioned.

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mation of their beaks, their necks, their feet, and their feathers ſuit their kind of life, which obſervation ought to be extended to all other birds.

The way of living of the *ſea-ſwallow* Fn. 129. deſerves to be particularly taken notice of; for as he cannot ſo commodiouſly plunge into the water and catch fiſh as other aquatic birds, the Creator has appointed the *ſea-gull* to be his caterer in the following manner. When this laſt is purſued by the former, he is forced to throw up part of his prey, which the other catches; but in the autumn, when the fiſhes hide themſelves in deep places, the merganſer, Fn. 113. ſupplies the gull with food, as being able to plunge deeper into the ſea. Act. Stock.

The chief granary of *ſmall birds* is the *knot-graſs*, Fol. Suec. 322. that bears heavy ſeeds, like thoſe of the *black bindweed*. It is a very common plant, not eaſily deſtroyed, either by the road ſide by trampling upon it, or any where elſe, and is extremely plentifull after harveſt in fields, to which it gives a reddiſh hue, by its numerous ſeeds. Theſe fall upon the ground, and are gathered all the year round by the ſmall birds.

[h] Thus bountifull nature feeds the fowls of the air.

The Creator has taken no leſs care of ſome *amphibious animals*, as the ſnake and frog kind, which, as they have neither wings to fly, nor feet to run ſwiftly, and commodiouſly, would ſcarcely have any means of taking their prey, were it not that ſome animals run, as it were of their own accord, into their mouths. When the *rattle-ſnake*, a native of America, with open jaws fixes his eyes on a bird, fly, or ſquirrel, ſitting on a tree, they fly down his throat, being rendered ſtupid, and giving themſelves up[i], as deſtitute of all refuge. On the other hand we cannot but adore the Creator's great goodneſs towards man, when we

[h] To which we may add, that many ſmall birds feed upon the ſeeds of *plantain*, particularly linnets. It is generally known, that the goldfinch lives upon the ſeed of *thiſtles*, from which he has its name in Greek, Latin, and French.

[i] How dreadful this ſerpent is to other animals will appear by an account we have in a treatiſe intitled, Radix Senega. Where the author Amæn. academ. vol. 2, ſays, one of theſe terrible ſerpents got clandeſtinely into the houſe of governor Blake at Cacolina; where it would have long laid concealed, had it not been that all the domeſtic animals, as dogs, hogs, turkies and fowls admoniſhed the family by their unuſual cries, equally ſhewing their horror and conſternation, their hair, briſtles, and creſts ſtanding up an end.

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conſider the rattle which terminates this ſerpent's tail. For by the means of that we have an opportunity of guarding againſt this dreadfull enemy; the ſound warning us to fly, which if we were not to do, and we ſhould be wounded by him, the whole body would be turned into a putrid corruption in ſix hours, nay ſometimes in half an hour.

The limits of this diſſertation will not permit me to produce more examples of this kind. But whoever will be at the pains to take ever ſo ſlight a view of the wonderfull works of the Creator, will readily ſee how wiſely the plan, order and fitneſs of things to divine ends are diſpoſed.

§. 16.

We cannot without the utmoſt admiration behold how providently the Creator has acted as to the preſervation of thoſe animals, which at a certain time of the year, are by the rigor of the ſeaſon excluded from the neceſſaries of life. Thus the *bear* in the autumn creeps into the *moſs*, which he has gathered, and there lies all winter; ſubſiſting upon no other nouriſhment but his fat, collected during the ſummer in the cellulous membrane, and which without

without doubt, during his faſt, circulates thro' his veſſels, and ſupplies the place of food; to which perhaps is added that fat juice which he ſucks out of the bottom of his feet.

The *hedge-hog*, *badger* and *mole* in the ſame manner fill their winter quarters with vegetables, and ſleep during the froſts.

The *bat* ſeems cold, and quite dead all the winter. Moſt of the *amphibious animals* get into dens, or to the bottom of lakes and pools.

In the autumn, as the cold approaches, and inſects diſappear, *ſwallows* [k] ſeek for an aſylum againſt the violence of the cold in the bottom of

[k] I never had but one credible teſtimony that ſwallows paſs the winter at the bottom of lakes or ponds; and this from a gentleman of character, who ſaw a ſwallow ſo found brought to life by warmth. On the other hand, i know of no author but Herodotus who mentions their being ſeen in any countrey during the winter. He, lib. 2, p. 109. edit. Steph. ſays, that ſwallows and kites continue all the year [illegible] of the Nile. What he mentions concern- [illegible] that they lye con- [illegible]

of lakes amongſt the reeds and ruſhes; from whence, by the wonderfull appointment of nature they come forth again. The periſtaltic motion of the bowels ceaſes in all theſe animals, while they are obliged to faſt, whence the appetite is diminiſhed, and ſo they ſuffer leſs from hunger. To this head may be referred the obſervation of the celebrated Liſter concerning thoſe animals; that their blood, when let into a baſon, does not coagulate, as that of all other animals, and ſo is no leſs fit for circulation than before.

The *moor-fowls* work themſelves out walks under the very ſnow. They moult in the ſummer, ſo that about the month of Auguſt they

appear. He quotes a paſſage from that author concerning the appearance of a vaſt number of kites at the mouth of the Boſphorus, but this happened at the latter end of May, and ſeems to prove nothing; for the time marked for their appearance by Calippus, who obſerved near the Helleſpont, is the month of March. Willughby ſays that kites are ſuppoſed to be birds of paſſage, and then quotes from Bellonius the place abovementioned.

From what has been ſaid it appears evident, that nothing certain is known by the moderns about the diſappearance of theſe remarkable birds, yet their coming was regularly noted by the antient writers, and coincided with that of ſwallows, as appears by the old calendars of Geminus and Ptolemy from the obſervations of Eudoxus, Euctemous, Calippus, and Doſitheus.

can-

cannot fly, and are therefore obliged to run into the woods; but then the moor-berries, and bilberries are ripe, from whence they are abundantly ſupplied with food. Whereas the young do not moult the firſt ſummer, and therefore tho' they cannot run ſo well, are able to eſcape danger by flight.

The *reſt of the birds* who feed upon inſects migrate every year to forreign regions, in order to ſeek for food in a milder climate; while all the northern parts, where they live well in the ſummer, are covered with ſnow.

Inſects in the winter generally lye hid within their caſes, and are nouriſhed by the ſurrounding liquor, like the fœtus of other animals, from whence at the approach of ſpring they awake, and fly forth to the aſtoniſhment of every one.

However all animals which lye hid in winter, do not obſerve theſe laws of faſting. Some provide ſtore-houſes in ſummer, and autumn, from which they take what is neceſſary, as *mice, jays, ſquirrels, bees.*

§. 17.

What i have obſerved in a few words concerning the migration of birds into forreign coun-

countries, gives me an opportunity of illuſtrating this ſubject farther by inſtances.

The *ſtarling*, Fn. 183. finding with us after the middle of ſummer worms in leſs plenty, yearly goes into Schonen, Germany and Denmark.

The *female chaffinches* every winter, about Michaelmas, go in flocks to Holland; but as the males ſtay with us, they come back the next ſpring, unleſs ſuch as chooſe to breed no more.

In the ſame manner the female *Caroline yellow-hammer* in the month of September, while the rice, on which ſhe feeds, is laid up in granaries, goes towards the ſouth, and returns in the ſpring to ſeek her mate.

Our *aquatic birds* are forced by neceſſity to fly towards the ſouth every autumn before the water is frozen. Thus we know that the lakes of Poland and Lithuania are filled with *ſwans* and *geeſe* every autumn, at which time they go in great flocks along many rivers as far as the Euxine. But in the beginning of ſpring, as ſoon as the heat of the ſun moleſts them, they turn back, and go again to the northern pools, and lakes, in order to lay their eggs. For there, and eſpecially in Lapland, there is a vaſt abundance of knats Fn. 1116. which afford them

excellent nouriſhment, as all of this kind live in the water, before they get their wings.

The *woodcock* Fn. 141. lives in England in winter, and departs from thence at the coming on of ſpring after they have paired.

The *ſwallow-tail'd ſheldrake* Fn. 96. croſſes Sweden in April, and does not ſtop till ſhe has reached the White ſea.

The *coblers awl* Fn. 137. goes every autumn into Italy.

The *arctic driver* Fn. 121. goes into Germany every ſpring and autumn.

The *miſſel thruſh* Fn. 189. fills our woods in the ſpring, but leaves us in the winter.

The *pied chaffinch* Syſ. Nat. 10. 97. 1. during the winter, being obliged to leave the alps*, haſtens into Sweden, and often into Germany.

The *gulls* viſit Spain and Italy.

The *raven*[1] goes into Schonen.

By theſe migrations birds alſo become uſeful to many different countries, and are diſtributed over almoſt all the globe. I cannot forbear expreſſing my admiration here, that all

* The Author means the Northern alps.

[1] I have tranſlated the word corvus by raven, becauſe Linnæus does not mention the carrion crow at all, either in the Faun. Suec. nor in the Syſt. Nat. before the late edition.

of

of them exactly obſerve the times of coming and going, and that they do not miſtake their way.

There is a very large ſhell-fiſh in the Mediterranean called the *pinna*, blind as all of that genus, but furniſhed with very ſtrong calcareous valves. (Bell. aquat. 401. t. 401. Jonſt. exſang. t. 16. f. 5, 6. Gualt. ind. t. 79, 79.) The *ſcuttle-fiſh* (Bell. aquat. 330. t. 331. Jonſt. exſang. t. 1. f. 1.) is an inhabitant of the ſame ſea, and a deadly enemy to the former; as ſoon as the *ſcuttle-fiſh* ſees the *pinna* open its ſhell, he ruſhes upon her like a lion, and devours her. The *pinnoteres* or *pinnophylax* (Jonſt. exſang. t. 29. f. 3.) is of the crab kind naked, like the hermit, and very quick-ſighted. This *cancer* or *crab* the *pinna* receives into her covering, and when ſhe opens her valves in queſt of food, lets him out to look for prey. During this the *ſcuttle fiſh* approaches; the *crab* returns with the utmoſt ſpeed and anxiety to his hoſteſs, who being thus warned of the danger ſhuts her doors, and keeps out the enemy. That very ſagacious obſerver D. D. Haſſelquiſt in his voyage towards Paleſtine beheld this curious phænomenon, which tho' well known to the antients had eſcaped the moderns. Ariſt. hiſt. lib. 5. c. 15. relates, that

that the *pinna* kept a guard to watch for her. That there grew to the mouth of the *pinna* a ſmall animal, having claws, and ſerving as a caterer, which was like a *crab*, and was called the *pinnophylax*. Plin. lib. 9. 51, ſays, the ſmalleſt of all the kinds is called the *pinnoteres*, and therefore liable to injury; this has the prudence to hide itſelf in the ſhells of *oyſters*. Again lib. 9. 66. he ſays [m] the *pinna* is of the genus of ſhell-fiſh; it is produced in muddy waters, always erect, nor ever without a companion, which ſome call the *pinnoteres*, others the *pinnophylax*. This ſometimes is a ſmall *ſquill*, ſometimes a *crab*, that follows the *pinna* for the ſake of food. The *pinna* is blind, and

[m] This is taken out of Ariſtotle, who ſeems to have thought, that the pinna grew from that which really is its beard, and which it throws out upon the adjoyning bodies in order to fix itſelf. For he ſays the pinna is produced from the byſſus, which is generally ſuppoſed to mean the beard of this ſhell-fiſh, and to have been uſed for making the fineſt of ſtuffs, frequently mentioned by antient writers under the name of Byſſine garments, and of which they now in ſome countries make ſtockings as I am informed. This notion of the pinna growing from the byſſus or beard is of the ſame kind with that which prevailed formerly in relation to the gooſe tree, mentioned by many writers, of whom a long liſt may be ſeen in the tenth edition of the Syſt. Nat.

when

when upon opening its ſhell it expoſes itſelf as a prey to the ſmalleſt kind of fiſhes, theſe immediately aſſault her, and growing bolder upon finding no reſiſtance venture in. The guard watching its time gives notice by a bite; upon which the *pinna* cloſing its ſhell, ſhuts in, kills, and gives part of whatever happens to be there to its companion.

The *pinna*, and the *crab* together dwell,
For mutual ſuccour in one common ſhell.
They both to gain a livelihood combine;
That takes the prey, when this has given the ſign.
From hence this *crab* above his fellows famed,
By antient Greeks was *pinnoteres* named.

OPPIAN.

§. 18.

Deſtruction.

We have obſerved above that all animals do not live upon vegetables, but that there are ſome which feed upon certain animalcula. Nay there are ſome which ſubſiſt only by rapine, and daily deſtroy numbers of the peaceable kind.

Theſe animals are deſtroyed, but in ſuch a

manner that the weaker generally are infeſted by the ſtronger in a continued ſeries. Thus the *tree-louſe* lives upon plants. The fly called *muſca aphidivora* lives upon the *tree-louſe*. The *hornet* and *waſp fly* upon the *muſca aphidivora*. The *dragon fly* upon the *hornet* and *waſp fly*. The *ſpider* on the *dragon fly*. The *ſmall birds* on the *ſpider*. And laſtly, the *hawk* kind on the *ſmall birds*.

In like manner the [n] *monoculus* delights in putrid waters, the *knat* eats the *monoculus*, the *frog* eats the *knat*, the *pike* eats the *frog*, the *ſea calf* eats the *pike*.

The *bat* and *goat-ſucker* make their excurſions only at night, that they may catch the *moths*, which at that time fly about in vaſt quantities.

The *wood-pecker* pulls out the *inſects* which lie hid in the trunks of trees.

The *ſwallow* purſues thoſe which fly about in the open air.

The *mole* purſues the *worms*. The large fiſhes devour the ſmall. Nay, we ſcarcely know an animal, which has not ſome enemy to contend with.

[n] An inſect that has no name in Engliſh, as far as i can find.

Amongſt

Amongſt quadrupeds *wild beaſts* are moſt remarkably pernicious, and dangerous to others, as the *hawk* kind among birds. But that they may not, by too atrocious a butchery, deſtroy whole ſpecies; even theſe are circumſcribed within certain bounds. Firſt, as to the moſt fierce of all, it deſerves to be noted how few they are in proportion to other animals. Secondly, the number of them is not equal in all countries. Thus France and England breed no *wolves*, and the northern countries no *tigers* or *lions*. Thirdly, theſe fierce animals ſometimes fall upon, and deſtroy one another. Thus the *wolf* devours the *fox*. The *dog* infeſts both the *wolf* and *fox*; nay *wolves* in a body will ſometimes venture to ſurround a *bear*. The *tiger* often kills its own male whelps. *Dogs* are ſometimes ſeized with madneſs and deſtroy their fellows, or with the mange deſtroy themſelves.

Laſtly, wild beaſts ſeldom arrive at ſo great an age as animals, which live on vegetables. For they are ſubject from their alcaline diet to various diſeaſes, which bring them ſooner to an end.

But although all animals are infeſted by their peculiar enemies, yet they are often able to

elude their violence by ſtratagems and force. Thus the *hare* often confounds the dog by her windings.

When the *bear* attacks *ſheep* and cattle, they draw up together for mutual defence. *Horſes* joyn heads together, and fight with their heels. *Oxen* joyn tails, and fight with their horns.

Swine get together in herds, and boldly oppoſe themſelves to any attack, ſo that they are not eaſily overcome; and it is worth while to obſerve, that all of them place their young, as leſs able to defend themſelves, in the middle, that they may remain ſafe during the battle.

Birds by their different ways of flying oftentimes eſcape the *hawk*. If the *pigeon* had the ſame way of flying as the *hawk*, ſhe would hardly ever eſcape his claws [o].

It deſerves alſo to be remarked, how much ſome animals conſult their ſafety by night. When *horſes* ſleep in woods, one by turns remains awake, and, as it were, keeps watch. When *monkies*, S. N. 2. 10. in Braſil ſleep upon

[o] As I have, when opportunities offered, meaſured and weighed ſeveral kinds of birds, i ſhall here ſubjoyn a table of ſome of them with the proportions of the weight to the ſail. N. B. By ſail i mean the extent of the wings and tail.

I do

upon trees, one of them keeps awake, in order to give the ſign, when the *tiger* creeps towards them,

I do not pretend to accuracy, and i imagine it will not be expected on a ſubject of this nature.

	Weight Avoirdupois. l.	oz.	Proportion of ſquare inches to the ounce.
Turkey ——	8	8	$2\frac{1}{4}$
Pheaſant ——	2	8	$2\frac{1}{4}$
Coot ——	2	8	$2\frac{1}{2}$
Black cock ——	2	6	$3\frac{1}{2}$
Puttock ——	1	14	18
Rook ——	1	3	$10\frac{1}{2}$
Partridge ——	1	1	3
Ivy owl ——	0	15	9
Ring-dove ——	0	14	10
Woodcock ——	0	10	6
Small hawk ——	0	$6\frac{3}{4}$	26
Wood-pecker —	0	4	9
Cuckow ——	0	4	18
Miſſel bird ——	0	4	14
Snipe ——	0	4	$9\frac{1}{2}$
Redſhank ——	0	4	9
Croſs bill ——	0	$1\frac{1}{2}$	$11\frac{1}{2}$
Houſe ſwallow —	0	1	18
Houſe ſparrow —	0	1	12
Wheat-ear ——	0	1	14
Linnet ——	0	$0\frac{1}{2}$	$20\frac{1}{2}$
Black cap ——	0	$0\frac{1}{2}$	18
Stone ſmich ——	0	$0\frac{1}{2}$	25
Beccaſigo ——	0	$0\frac{1}{2}$	24
White throat —	0	$0\frac{1}{2}$	17
		grains.	
Long tailed titmouſe	0	95	25
Regulus criſtatus	0	76	23

them, and in caſe the guard ſhould be caught aſleep, the reſt tear him to pieces *. Hence the hunting of rapacious animals is not always ſucceſsfull, and they are often obliged to labor a whole day to no purpoſe. For this reaſon the Creator has given them ſuch a nature, that they can bear faſting a long time. Thus the *lion* lurks in his den many days without famiſhing, and the *wolf*, when he has once well ſatisfied his hunger, can faſt many weeks without any difficulty.

It appears by this table that the ſmaller birds in general have more ſail in proportion than the larger of the eſculent kind, ſuch as the pheaſant, partridge, woodcock, ring-dove, &c. and that it ſhould be ſo contrived appears reaſonable on more accounts than one. Firſt, becauſe ſmall birds living, many of them, amongſt ſhrubs and buſhes, are obliged to make ſhort and quick motions in hopping from bough to bough, at which time they always make uſe of their wings; ſome of them live chiefly on worms and flies, which are not to be caught without great nimbleneſs, and frequent gardens and houſes, and are more liable to the attacks of cats and other animals. And thoſe which live in open fields are expoſed to the hawk, and were they not quick at turning they would ſcarcely ever eſcape.

Again the different proportions of the bulk to the ſurface in large and ſmall birds is to the diſadvantage of the latter, on account of the greater proportional reſiſtance of the air, and this wanted ſome compenſation.

More might be added on this ſubject, but i am afraid moſt readers will think what i have already ſaid is more than enough.

* Maregraf. Braſ. 227. Biberg.

If we conſider the end for which it pleaſed the Supreme Being to conſtitute ſuch an order of nature, that ſome animals ſhould be, as it were, created only to be miſerably butchered by others, it ſeems that his Providence not only aimed at ſuſtaining, but alſo keeping a juſt proportion amongſt all the ſpecies; and ſo prevent any one of them increaſing too much, to the detriment of men, and other animals. For if it be true, as it is moſt aſſuredly, that the ſurface of the earth can ſupport only a certain number of inhabitants, they muſt all periſh, if the ſame number were doubled, or tripled. Derh. Phyſ. Theol. p. 237.

There are ſome viviparous *flies*, which bring forth 2000 young. Theſe in a little time would fill the air, and like clouds intercept the rays of the ſun, unleſs they were devoured by birds, ſpiders, and many other animals.

Storks, and *falcons* free Ægypt from *frogs*, which after the inundation of the Nile, cover all the countrey. The ſame birds alſo clear Paleſtine of *mice*. Bellonius on this ſubject ſays as follows. "The *ſtorks* come to Ægypt "in ſuch abundance, that the fields and mea- "dows are white with them. Yet the Ægyp- "tians are not diſpleaſed with this ſight; as

‖ Muſchenbr.

" *frogs* are generated in ſuch numbers there, " that did not the *ſtorks* devour them, they " would over-run every thing. Beſides they " alſo catch, and eat *ſerpents*. Between Belba " and Gaza the fields of Paleſtine are often " deſert on account of the abundance of *mice*, " and *rats*; and were they not deſtroyed by " the *falcons*, that come here by inſtinct, the " inhabitants could have no harveſt."

The *white fox* S. N. 8. 7. is of equal advantage in the Lapland alps; as he deſtroys the Norway *rats*, Fn. 26. which are generated there in great abundance; and thus hinder them from increaſing too much in proportion, which would be the deſtruction of vegetables.

It is ſufficient for us, that nothing is made by Providence in vain, and that whatever is made, is made with ſupreme wiſdom. For it does not beome us to pry too boldly into all the deſigns of God. Let us not imagine, when theſe rapacious animals ſometimes do us miſchief, that the Creator planned the order of nature according to our private principles of œconomy; for the Laplanders have one way of living; the European huſbandman another; the Hottentots and ſavages a third, whereas the ſtupendous œconomy of the Deity is one through-

throughout the globe, and if Providence does not always calculate exactly according to our way of reckoning, we ought to conſider this affair in the ſame light, as when different ſeamen wait for a fair wind, every one, with reſpect to the part he is bound to, who we plainly ſee cannot all be ſatisfied.

§. 19.

The whole earth would be overwhelmed with carcaſes, and ſtinking bodies, if ſome animals did not delight to feed upon them. Therefore when an animal dyes, *bears*, *wolves*, *foxes*, *ravens*, &c. do not loſe a moment till they have taken all away. But if a *horſe*, e. g. dyes near the public road, you will find him, after a few days, ſwoln, burſt, and at laſt filled with innumerable *grubs* of carnivorous *flies*, by which he is entirely conſumed, and removed out of the way, that he may not become a nuſance to paſſengers by his poiſonous ſtench.

When the carcaſes of fiſhes are driven upon the ſhore, the voracious kinds, ſuch as the *thornback*, the *hound fiſh*, the *conger eel*, &c. gather

about and eat them. But becauſe the flux, and reflux ſoon change the ſtate of the ſea, they themſelves are often detained in pits, and become a prey to the wild beaſts, that frequent the ſhores. Thus the earth is not only kept clean from the putrefaction of carcaſes, but at the ſame time by the œconomy of nature the neceſſaries of life are provided for many animals. In the like manner many *inſects* at once promote their own good, and that of other animals. Thus *knats* lay their eggs in ſtagnant, putrid and ſtinking waters, and the *grubs* that ariſe from theſe eggs clear away all the putrefaction; and this will eaſily appear, if any one will make the experiment by filling two veſſels with putrid water, leaving the *grubs* in one, and taking them all out of the other. For then he will ſoon find the water, that is full of *grubs*, pure and without any ſtench, while the water that has no *grubs* will continue ſtinking.

Lice increaſe in a wonderfull manner in the heads of children, that are ſcabby, nor are they without their uſe, for they conſume the redundant humours.

The *beetle* kind in ſummer extract all moiſt and glutinous matter out of the dung of cattle,

ſo

ſo that it becomes like duſt, and is ſpread by the wind over the ground. Were it not for this, the vegetables that lye under the dung, would be ſo far from thriving, that all that ſpot would be rendered barren.

As the excrements of *dogs* is of ſo filthy and ſeptic a nature, that no *inſect* will touch them, and therefore they cannot be diſperſed by that means, care is taken that theſe animals ſhould exonerate upon ſtones, trunks of trees, or ſome high place, that vegetables may not be hurt by them.

Cats bury their dung. Nothing is ſo mean nothing ſo little, in which the wonderful order, and wiſe diſpoſition of nature does not ſhine forth.

§. 20.

Laſtly, all theſe treaſures of nature ſo artfully contrived, ſo wonderfully propagated, ſo providentially ſupported throughout her three kingdoms, ſeem intended by the Creator for the ſake of man. Every thing may be made ſubſervient to his uſe, if not immediately, yet mediately, not ſo to that of other animals. By the help of reaſon man tames the fierceſt animals,

mals, purſues and catches the ſwifteſt, nay he is able to reach even thoſe which lye hid in the bottom of the ſea.

By the help of reaſon he increaſes the number of vegetables immenſely, and does that by art, which nature, left to herſelf, could ſcarcely effect. By ingenuity, he obtains from vegetables whatever is convenient or neceſſary for food, drink, cloathing, medicine, navigation, and a thouſand other purpoſes.

He has found the means of going down into the abyſs of the earth, and almoſt ſearching its very bowels. With what artifice has he learned to get fragments from the moſt rocky mountains, to make the hardeſt ſtones fluid like water; to ſeparate the uſefull metal from the uſeleſs droſs, and to turn the fineſt ſand to ſome uſe! In ſhort when we follow the ſeries of created things, and conſider how providentially one is made for the ſake of another, the matter comes to this, that all things are made for the ſake of man; and for this end more eſpecially, that he by admiring the works of the Creator ſhould extoll his glory, and at once enjoy all thoſe things, of which he ſtands in need, in order to paſs his life conveniently and pleaſantly.

§. 21.

§. 21.

This ſubject concerning the œconomy of nature, a very ſmall part of which i have lightly touched upon, is of ſuch importance and dignity, that if it were to be properly treated in all its parts, men would find wherewithal to employ almoſt all the powers of the mind. Nay time itſelf would fail before even the moſt acute human ſagacity would be able to diſcover the amazing œconomy, laws, and exquiſite ſtructure of the leaſt inſect, ſince as Pliny obſerves, nature no where appears more herſelf, than in her moſt minute works. Every ſpecies of created beings deſerves to engroſs one examiner.

If according to groſs calculation we reckon in the world 20,000 ſpecies of *vegetables*, 3000 of *worms*, 12000 of *inſects*, 200 of *amphibious animals*, 2600 of *fiſhes*, 2000 of *birds* [p], 200 of *quadrupeds*; the whole ſum of the ſpecies of living creatures will amount to 40000. Out of theſe our countrey has ſcarcely 3000,

[p] How the author came to reckon 2000 ſpecies of birds in the world i cannot gueſs, for in the Syſt. Nat. Linn. edit. 6. there are only about 150 mentioned, and in the laſt edition of that book not above 550.

for

for we have diſcovered only about 1200 native plants, and about 1400 ſpecies of animals. We of the human race, who were created to praiſe and adore our Creator, unleſs we chooſe to be mere idle ſpectators, ſhould and in duty ought to be affected with nothing ſo much as the pious conſideration of this glorious palace. Moſt certainly if we were to improve and poliſh our minds by the knowledge of theſe things; we ſhould, beſides the great uſe which would accrue to our œconomy, diſcover the more excellent œconomy of nature, and more ſtrongly admire it when diſcovered.

Omnium elementorum alterni recurſi ſunt,
Quicquid alteri perit in alterum tranſit.
Senec. Nat. III. 10.

THE foregoing piece, though on a ſubject often treated by learned and ingenious men, ſeems to me to contain many things new and curious, and to give a more comprehenſive and diſtinct view, as it were in a map, of the ſeveral parts of nature, their connections and dependencies, than is any where elſe to be found. But excluſive of this or any other comparative merit, it certainly conveys an uſefull

leſſon, and ſuch an one as the beſt of us often want to have inculcated.

From a partial conſideration of things, we are very apt to criticiſe what we ought to admire; to look upon as uſeleſs what perhaps we ſhould own to be of infinite advantage to us, did we ſee a little farther; to be peeviſh where we ought to give thanks; and at the ſame time to ridicule thoſe, who employ their time and thoughts in examining what we were, i. e. ſome of us moſt aſſuredly were, created and appointed to ſtudy. In ſhort we are too apt to treat the Almighty worſe than a rational man would treat a good mechanic; whoſe works he would either thoroughly examine, or be aſhamed to find any fault with them. This is the effect of a partial conſideration of nature; but he who has candour of mind and leiſure to look farther, will be inclined to cry out:

How wond'rous is this ſcene! where all is form'd
With number, weight, and meaſure! all deſign'd
For ſome great end! where not alone the plant
Of ſtately growth; the herb of glorious hue,
Or food-full ſubſtance; not the laboring ſteed,
The herd, and flock that feed us; not the mine
That yields us ſtores for elegance, and uſe;

The

The ſea that loads our table, and conveys
The wanderer man from clime to clime, with all
Thoſe rolling ſpheres, that from on high ſhed down
Their kindly influence; not theſe alone,
Which ſtrike ev'n eyes incurious, but each moſs,
Each ſhell, each crawling inſect holds a rank
Important in the plan of Him, who fram'd
This ſcale of beings; holds a rank, which loſt
Wou'd break the chain, and leave behind a gap
Which nature's ſelf would rue. Almighty Being,
Cauſe and ſupport of all things, can i view
Theſe objects of my wonder; can i feel
Theſe fine ſenſations, and not think of thee?
Thou who doſt thro' th' eternal round of time;
Doſt thro' th' immenſity of ſpace exiſt
Alone, ſhalt thou alone excluded be
From this thy univerſe? Shall feeble man
Think it beneath his proud philoſophy
To call for thy aſſiſtance, and pretend
To frame a world, who cannot frame a clod?—
Not to know thee, is not to know ourſelves—
Is to know nothing—nothing worth the care
Of man's exalted ſpirit—all becomes
Without thy ray divine, one dreary gloom;
Where lurk the monſters of phantaſtic brains,
Order bereft of thought, uncaus'd effects,

Fate

Fate freely acting; and unerring Chance.
WHERE meanleſs matter to a chaos ſinks
Or ſomething lower ſtill, for without thee
It crumbles into atoms void of force,
Void of reſiſtance—it eludes our thought.
WHERE laws eternal to the varying code
Of ſelf-love dwindle. Intereſt, paſſion, whim
Take place of right, and wrong, the golden chain
Of beings melts away, and the mind's eye
Sees nothing but the preſent. All beyond
Is viſionary gueſs—is dream—is death.

ON THE

FOLIATION of TREES.

ON THE FOLIATION of TREES;

OR,

The time when they put out their leaves.

By *HARALD BARCK.*

UPSAL, 1753. May 3.

Amæn. Acad. vol. iii.

§. 1.

BOtaniſts in every age have not only taken great pains to diſcover and give names to plants, but have alſo deſcribed them with all poſſible accuracy. But this part of knowledge has been, till this preſent age, confined to narrower bounds than it deſerved; for an opinion has prevailed amongſt almoſt all the men of learning, that it is of no uſe out of the re-

gions of medicine. From whence it has happened, that we find very few that have cultivated botany, but phyſicians; nor have even theſe carried their inquiries farther than to obtain a moderate knowledge of officinal plants. But in our times ſome, who are worthy of the higheſt regard from all true lovers of this ſtudy, have endeavoured to find out and inveſtigate the vertues of plants with greater care, and induſtry. For theſe men beſides medical uſes have diſcovered great, and remarkable advantages accruing from ſuch reſearches.

However i do not intend to give a catalogue of them here, but ſhall content myſelf with juſt touching upon ſome few things, that have been done in this way, in our own univerſity. In the *Philoſophia Botanica* our illuſtrious preſident has ſhewn, that every ſoil has its own peculiar plants, which we ſhould ſeek for in vain any where elſe; and that certain plants keep, as it were, their watches, i. e. expand their flowers and cloſe them again at ſtated times[q]. The diſſertation on the *eſpouſals of plants* has imparted to the learned world the uſe of various phænomena, which

[q] Vid. Philoſ. Botan. p. 263, 273. Barck. This curious ſubject is amply treated in Amæn. Acad. vol. 4.

occur

occur in the fœcundation of plants. The *Flora œconomica* has faithfully ſet forth the uſe of plants in private life. The diſſertation on the *buds of plants* has opened to us the cauſe, why various trees cannot bear the ſnows, and froſts of our part of the world. From the eſſay on the *eſculent plants* of our countrey we find, that there are many plants growing with us which are proper for food, hitherto overlooked. In the *Swediſh Pan*, it is ſhewn, that certain plants only are deſtined for ſuſtenance to certain animals. From the *Hoſpita Inſectorum Flora* we are informed that certain vegetables are eat by certain ſpecies of inſects.

It is now the fourth year ſince our illuſtrious preſident exhorted his countreymen to obſerve with all care and diligence, at what time every tree expands its buds, and unfolds its leaves; imagining, and not without good reaſon, that our countrey would ſome time or other, from obſervations of this kind made in different places, reap ſome new, and perhaps unexpected advantage. Upon this admonition, i at that time living in Smoland with that noble perſon G. A. Witting major, and knight of the military order, was incited to obſerve for the ſpace of three years, beginning from the year

1750, the days when different trees began to put out their leaves, when the countreymen ſowed their fields, and how much time there paſſed between ſeed time, and harveſt. This i did with intent, if poſſible, to find out fixed laws by which to regulate the proper ſeed-time in every province. But the few obſervations, which i was able to make, were not ſufficient for this purpoſe; that the work therefore which i meditated might not reſt upon too ſlight a foundation, our preſident communicated all the papers ſent to him from different places for my examination. Such then is the deſign of this eſſay, and i ſubmit it to the candid reader, hoping that he will look upon it with an indulgent eye.

§. 2.

Our lands, which lye under a cold ſky, are bound up with froſt all the winter. Hence the roots of our plants oppreſſed, as it were, with a drowſy ſleep, are benummed, and many herbs, that remain above ground, dye[1]. But when

[1] We have had five winters remarkably ſevere in Sweden, viz. 1665, 1683, 1708, 1732, and 1751. The cold of which laſt Feb. 1. N.S. was extremely intenſe, and ſuch as has

when the ſun by its mild rays at the beginning of ſpring refreſhes the earth, the ſnows melt, the

has ſcarcely been known in this age, for the botanic thermometer ſunk to 32 degrees. Barck.

In that thermometer the freezing point is 0, and that of boiling water 100. So that taking it for granted that the author muſt mean 32 below 0, this point would anſwer to 57 below 32 or the freezing point of Farenheit, which is a degree of cold never known in this countrey. I am aſſured from good authority, that in the year 1739 the thermometer did not ſink nine degrees below freezing point in England. They who are curious to ſee much more ſurpriſing inſtances of cold than that in Sweden, may conſult the preface to Gmelin's Flora Sibirica, where they will find how very apt philoſophers are to fall into miſtakes about the powers of nature, when they truſt to theory inſtead of conſulting experience. Monſ. Maupertuis ſays, that the mercury in Reaumur's thermometer in Lapland ſunk to 37 degrees below freezing point, which is equal to 67 degrees in Farenheit.

Perhaps, ſays Linnæus in the Flora Lapponica, the curious reader will wonder how the people in Lapland during the terrible cold, that reigns there in winter, can preſerve their lives; ſince almoſt all birds, and even ſome wild beaſts, deſert it at that time. The Laplander not only in the day, but thro' whole winter nights is obliged to wander about in the woods with his herds of rhen deer. For the rhen deer never come under cover, nor eat any kind of fodder, but a particular kind of *liverwort*. On this account the herdſmen are under a neceſſity of living continually in the woods, in order to take care of their cattle, leſt they ſhould be devoured by wild beaſts. The Lap-

the ice gives way, the froſt is diſſolved, and a joyful face of things returns. Immediately we ſee

Laplander eaſily does without more light, as the ſnow reflects the rays that come from the ſtars, and as the *aurora borealis* illuminates the air every night with a great variety of figures. The cold is ſo great that forreigners are kept aloof, and even deterred from their moſt happy woods. No part of our body is more eaſily deſtroyed by cold than the extremities of the limbs, which are moſt remote from the ſun of this microcoſm, the heart. The kibes that happen to our hands, and feet, ſo common in the northern parts of Sweden, prove this. In Lapland you will never ſee ſuch a thing, altho' were we to judge by the ſituation of the countrey we ſhould imagine juſt the contrary, eſpecially as the people wear no ſtockings, as we do, not only ſingle but double, and triple. The Laplander guards himſelf againſt the cold in the following manner. He wears breeches made of rhen deer ſkins with the hair on, reaching down to his heels; and ſhoes made of the ſame materials, the hairy part turned outwards. He puts into his ſhoes *ſlender-eared broad-leaved cyperus graſs*, carex veſicaria, Spec. Pl. that is cut in ſummer and dryed. This he firſt combs, and rubs in his hands, and then places it in ſuch a manner, that it not only covers his feet quite round, but his legs alſo; and being thus guarded, he is quite ſecured againſt the intenſe cold. With this graſs they ſtuff their gloves likewiſe in order to preſerve their hands. As this graſs keeps off the cold in winter, ſo in ſummer it hinders the feet from ſweating, and at the ſame time preſerves their feet from being annoyed by ſtriking againſt ſtones, &c. for their ſhoes are very thin, being made, not of tanned leather, but the raw hide. It was

ſee the vernal flowers begin to celebrate their nuptials, and the trees, one after another, open their buds, and cloath themſelves with leaves. It is a matter of wonder why the *wood plants*, as the *ſpurge laurel*, the *wood anemone*, the *noble liverwort*, the *vernal vetch*, the *broom rape*, the *paſque flower*, the *colts-foot*, the *ſage of Jeruſalem*, *pilewort*, *violets*, &c. and the garden plants, as the *aſſara bacca*, *ſnow drops*, *bulbous violet*, *vernal crocus*, &c. ſhould flower in the very beginning of ſpring; when we cannot by any pains, or care bring them to flower in the autumn, or after the ſummer ſolſtice. For it is remarkable that theſe plants, which are ſo very patient of the cold in the ſpring, are yet in the autumn ſo tender, and weak, that they dye like the Indian plants upon the firſt hoar froſt [a], e. g. the

was difficult for me to find what particular kind of graſs they prefer for this purpoſe, as not being every where the ſame, tho' always one of the *cyperus graſſes*, but i perceived at laſt that it was what i mentioned above. Thus far Linnæus. I will add, that this graſs grows with us.

[a] The iron nights, as they are called in the Swediſh language, i. e. ſharp nights, happen generally at Upſal between the 19th and 31ſt of Auguſt. e. g. 1746 they began the 19th, 1748 the 17th, 1749 the 1ſt of Sept. 1750 the 20th of Auguſt, 1751 the 27th, 1752 the 20th. They ſeldom

the *blue mountain thiſtle*, *touch-me-not*, &c. On the contrary we ſee *ſuccories* and *thiſtles* never flower before the ſame ſolſtice, whence the huſbandman judges from their flowers, as from a calendar that cannot deceive, that the ſolſtice is paſt. From hence it is evident, that there is ſomething elſe beſides moiſture and heat which promotes the fertility of plants.

§. 3.

In the ſame manner trees obſerve fixed laws, and a certain order in their leafing; ſo that he, who is but moderately verſed in this affair,

ſeldom laſt above three or four nights. After theſe barley does not grow, and about the time they come on, the gardeners do not venture to truſt their green-houſe and other tender plants any longer to the open air. At that time the leaves of the *fig*, the *mulberry*, the *walnut*, the *vine*, the *toxicodendrum*, and even of the *beech* are ſhrivelled up. The Indian plants, ſuch as the *kidney bean*, the *African marygold*, the *cucumber* the *amaranth*, the *convolvulus*, the *tobacco*, the *thorn apple*, &c. dye. Nay, ſometimes even our native plants, as the *noli me tangere*, the *leſſer burdock*, the *bryony*, the *vipers buglos*, the *pimpernel*, the *blue mountain ſow-thiſtle*, the *gooſewort*, &c. wither. But before this happens, the *meadow ſaffron* puts forth its flowers, and that ſometimes ſooner, ſometimes later, according as theſe iron nights come ſooner or later. Barck.

may

may immediately know, when he ſees one ſpecies of trees in leaf, what ſpecies will be next in leaf. Nor do we hardly ever find this order of Flora tranſgreſſed. He who ſhould imagine he had found the true cauſe of this phænomenon in the different depths of the roots of different trees would be miſtaken; for then ſhrubs would always be in leaf before trees of one, and the ſame kind; which yet rarely happens. This phænomenon therefore ariſes without doubt from ſome other cauſe, hitherto undiſcovered, and perhaps explicable only by the different texture of the tree.

The order of the leafing of trees with us is as follows.

1 *Red elder*
2 *Honey ſuckle*
3 *Gooſeberry*
4 *Red currant*
5 *Spiræa frutex*
6 *Bird cherry*
7 *Spindle tree*
8 *Shrub cinquefoil*
9 *Common elder*
10 *Privet*
11 *Quicken tree*
12 The *oſier*
13 *Alder*
14 *Sea buckthorn*
15 *Apple tree*
16 *Cherry tree*
17 *Water elder*
18 *Birch*
19 *Haſel*
20 *Elm*
21 *Dog roſe*
22 *Pear tree*
23 *Plum*

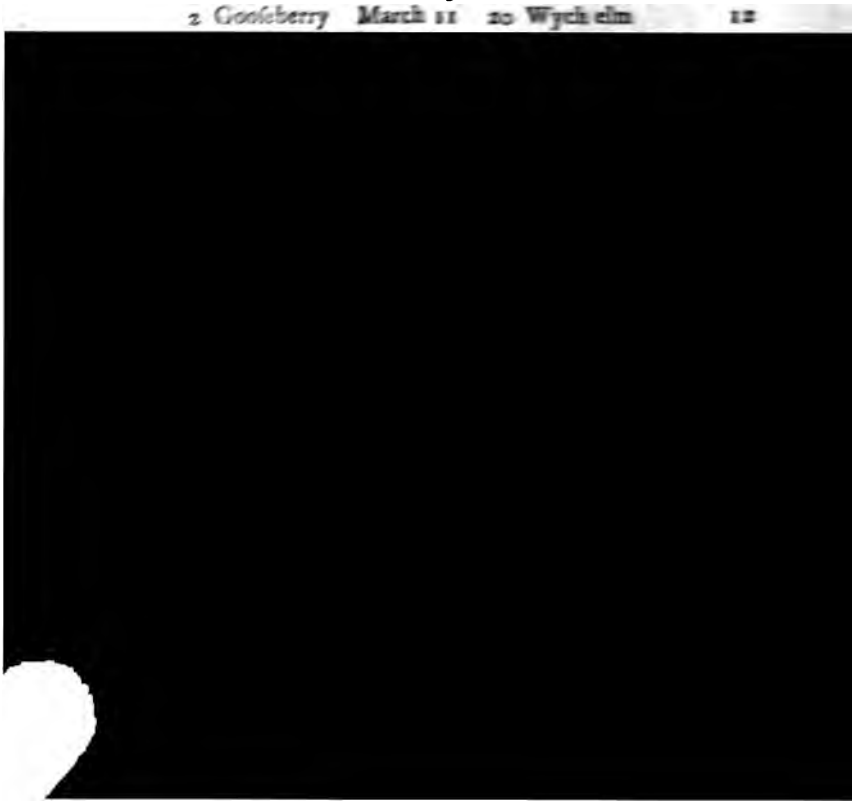
ON THE SEASON

1 [illegible]	18 [illegible]
2 [illegible]	19 [illegible]
3 [illegible]	20 Maple
4 [illegible]	21 The ash
5 [illegible]	22 The oak

When the birch first breaks into leaf, the crimson cherry puts forth its buds, next the bay a little before the equinox. The lime,

* As I do not know that any thing of this kind has ever been published in England, I will shew the order of the leafing of some trees and herbs, as observed by me in Norfolk, Ann. 1755.

1 Honeysuckle	Jan. 15	19 Marsh elder	Apr. 11
2 Gooseberry	March 11	20 Wych elm	12



the *maple*, the *poplar*, the *elm*, the *ſallow*, the *alder*, the *filberd* and *haſel* are among the firſt that put out leaves; the *plane tree* alſo is very early. Nat. Hiſt. lib. 16. 25.

The foliation or leafing of the firſt four named trees, 1, 2, 3, 4, varies very much as to the time, and the day on which they break bud; for as the winter goes off ſooner or later, ſo they are in leaf ſooner or later. But this does not hold of the reſt, e. g. in the year 1750, in which there was ſcarcely any winter-weather, but the whole was almoſt a perpetual ſpring, I obſerved towards the latter end of March, that the *currant* and *gooſeberry* were in blow about Gripenberg; whereas the laſt year they did not blow till the middle of April. The *oak*, and the *aſh* ſeldom ſhew their leaves before the night froſts are over [v]. For which reaſon gardeners do not venture to truſt their houſe plants to the open air, till the leaves of the laſt trees give ſign of a mild winter.

[v] This agrees with lord Bacon's obſervations, Nat. Hiſt. p. 146. that a long winter makes the earlier and later flowers come together. This I obſerved was the caſe in the year 1755, when the ſpring was very backward. The author ſays in a note, that it has been obſerved for above ten years paſt, that the oak has been always in leaf before the end of May, in Upland.

§. 4.

§. 4.

The prudent huſbandman will above all things watch with the greateſt care the proper time for ſowing; becauſe this with the Divine aſſiſtance produces plenty of proviſions, and lays the foundation of the public welfare of the kingdom, and of the private happineſs of the people. The ignorant farmer being more tenacious of the ways, and cuſtoms of his anceſtors, fixes his ſowing ſeaſon generally to a month, and to a day; whether or no the earth be prepared to receive the ſeed he little cares. From whence it frequently happens, that the fields do not return what might be expected, and that what the ſower ſowed with ſweat, the reaper reaps with ſorrow. Wiſe œconomiſts therefore in all ages have endeavored to their utmoſt to fix a certain time for ſowing; but hitherto their labor has proved fruitleſs. There have been ſome, who have tryed to diſcover the qualities of the land neceſſary for this purpoſe, by taſte and ſmell; nor have there been wanting too others, who were perſuaded, that the ſmell of the earth, and the *fila divæ virginis* *, were infallible ſigns of ſeed-time. All

* I do not underſtand the meaning of theſe words.

which,

which, although perhaps they are not wholly without foundation, are yet inſufficient for obtaining the end we aim at. For the experience of many years has taught us, that the ſeeds of one and the ſame ſpecies ſown in the ſame ground at different times do not produce equal crops. We have ſeen even a great difference between what was ſown in the morning and the afternoon. Thus alſo while one plant is vigorous and floriſhes, another of the ſame nature, and raiſed in the ſame ſoil withers, and dyes. The farmer often throws the cauſe of ſcarcity upon Providence, that means to puniſh an ungrateful people, by ordering the fields to mourn in weeds, and the corn to mock the threſhers toil with empty huſks; but it may be with truth aſſerted, that this ſurmiſe is often without foundation. He ought rather to complain of his own imprudence, and accuſe himſelf that his granary is not better ſtored.

We look up to the ſtars [u], and without reaſon ſuppoſe that the changes on earth will anſwer

[u] This looking up to the ſtars for this purpoſe, was tranſmitted down to us by the Greeks and Romans from Ægypt, where the ſeaſons being much more regular than in theſe northern parts, might be as ſure a guide in that countrey, as any they could follow. But an aſtronomical calendar

anſwer to the heavenly bodies; entirely neglecting the things that grow round about us. We

calendar perhaps may not be ſo good a guide to us as the vegetation of certain plants; ſuppoſing we could once fix on the proper one for ſowing each kind of ſeed. I have been told by a common huſbandman in Norfolk, that when the oak catkins begin to ſhed their ſeed, it is a proper time to ſow barley; and why might not ſome other tree ſerve to direct the farmer as to other ſeeds? The prudent gardener never ventures to put his houſe plants out, till the mulberry leaf is of a certain growth.

It appears from Geminus in his elements of aſtronomy, that the coincidence of the ſeaſons, as to heat, cold, rain, &c. with the riſings and ſettings of the ſtars, had cauſed a notion to prevail among the antients, that theſe celeſtial phænomena were not merely the ſigns, but the cauſes of the different ſeaſons. This notion, which he takes ſome pains to overturn, would never have begun in ſuch uncertain climates, as are found in theſe parts of the world. But in Ægypt, where the Nile begins to riſe regularly upon the appearance of Sirius, or the dog-ſtar, where the Eteſian winds begin, and ceaſe to blow conſtantly about the ſame time of the year; and in general the variation of the weather is nearly uniform, ſuch a notion might eaſily prevail in the minds of an unenlightened and ſuperſtitious people. From them it was propagated into Greece, where, tho' it muſt have been frequently thwarted by a much leſs conſtant uniformity, yet it might ſtill be upheld by that blind veneration, which generally attends antiquity, eſpecially amongſt the ignorant and unlearned. As for the Romans, they went ſtill farther, for without even adapting an almanack to their own climate and time, they fixed the ſeaſons for huſbandry work of all kinds by the riſings and ſettings of the ſtars, ſuch as they found

We ſee trees open their buds, and expand their leaves; from hence we conclude that ſpring

found them in the Greek calendars. To this cuſtom Geminus certainly alludes when he obſerves, that an almanack, which may pretty well foretell the weather in one countrey is good for nothing in another, as one would think ſhould be obvious at firſt ſight. Yet this he thought neceſſary to explain, and dilate upon, in order to convince the Romans of their error; for tho', as Petavius obſerves, the later aſtronomers went more accurately to work, the prejudice ſtill remained in the minds of the countrey people, and the vulgar. Whether Geminus thought thoſe predictions concerning heat, cold, rain, drought, &c. which are found in the Alexandrian, Greek, and Roman calendars, juſt as in ſome of our modern ones, were univerſally precarious, or whether he only thought they were ſo in ſuch climates, as that of Rome, where he is ſuppoſed to have lived, he commends Aratus for making uſe of the natural ſigns, taken from the aſpects of the ſun, and ſome of the ſtars, as alſo of the ſigns taken from brutes, inſtead of the riſing and ſetting of the ſtars, and gives this reaſon of his preference, that thoſe predictions which have ſome natural cauſe, have a neceſſary effect; adding, by way of confirmation of his opinion, that Ariſtotle, Eudoxus, and many other aſtronomers, made uſe of them. Theſe predictions are copied by Virgil, but i do not recollect any place in his Georgics, where the ſeaſons for ploughing, ſowing, &c. are fixed by the appearance of birds of paſſage, or of inſects, or by the flowering of plants, which method was begun by Heſiod, but never afterwards attended to, that i know, till Linnæus wrote. Heſiod ſays, that if it ſhould happen to rain three days together when the *cuckow* ſings, then late ſowing will be as good as early ſowing. That when *ſnails* begin to creep out of their holes, and climb

ſpring approaches, and experience ſupports us in this concluſion; but no body hitherto has been

up the plants, you muſt leave off digging about vines and take to pruning. That when the *artichoak* begins to blow, and the *graſhopper* chirps upon trees, which, as Theophraſtus obſerves, was about the ſummer ſolſtice, then goats are in full ſeaſon, &c. That when the *fig leaf* is about as big as a crow's foot, the time for ſailing comes on. That when the voice of the *crane* is heard overhead, then is the time for ploughing. It is true, the poet frequently marks the ſeaſons, by the riſings and ſettings of the ſtars, and as aſtronomy, beſides its many important uſes, is connected with finer ſciences, has ſomething in it very ſtriking to the imagination, and has been cultivated by men, who had leiſure to make calendars for general uſe, it was natural that it ſhould get the aſcendant over rules ſurer perhaps in themſelves, and more adapted to the purpoſe of the huſbandman, but which were deſtitute of the advantages abovementioned, and were moſt probably looked on only as poetical embelliſhments.

It is wonderfull to obſerve the conformity between vegetation, and the arrival of certain birds of paſſage. I will give one inſtance as marked down in a diary kept by me in Norfolk in the year 1755. April the 16th *young figs* appear, the 17th of the ſame month the *cuckow* ſings. Now the word κοκκυξ ſignifies a *cuckow*, and likewiſe the *young fig*, and the reaſon given for it is that in Greece they appeared together. I will juſt add that the ſame year i firſt found the *cuckow flower* in blow the 19th of April.

To the inſtance of coincidence of the appearance of the *cuckow*, and the fruit of the *fig-tree* in Greece and England, i will

been able to ſhew what kind of tree Providence intended ſhould be our calendar, ſo that we might know on what day the countreyman ought to ſow his grain.

The ſun acts on the earth by looſening, warming and preparing it, as the culinary fire does on our meat, for which a certain degree of heat is requiſite. For the ſun by its heat drives the juices taken in by the roots thro' the veſſels of the tree, which do not return by circulation, but become more copious by the daily addition of freſh heat. It. Scan. 23.

i will here add ſome coincidences of the like nature, in Sweden and England.

Linnæus ſays, that the *wood-anemone* blows from the arrival of the *ſwallow*. In my diary for the year 1755, i find the *ſwallow* appeared April the 6th, and the *wood-anemone* was in blow the 10th of the ſame month. He ſays, that the *marſh-marygold* blows when the *cuckow* ſings. According to my diary the *marſh-marygold* was in blow April the 7th, and the ſame day the *cuckow* ſung.

I have many other obſervations by me about the appearance of birds and the flowering of plants, but as they were made for one year only, and there are none of other authors to compare them with, i ſhall not trouble the reader with them. I have been induced to publiſh them for reaſons that i have mentioned in the preface. Vid. the Calendar of Flora.

§. 5.

Nature always takes the eaſieſt, and ſhorteſt way in all her works. He therefore who would imitate her muſt do the ſame. No one, i think, can deny but that the ſame force, which brings forth the leaves of trees, will alſo make the grain vegetate; and no one can juſtly aſſert that a premature ſowing will always, and every where accelerate a ripe harveſt. Perhaps therefore we cannot promiſe ourſelves a happy ſucceſs by any means ſo likely, as by taking our rule for ſowing from the leafing of trees. We

only the time of the foliation of trees, but the day alſo on which *barley* was ſown, and cut; and were ſo kind as to communicate to me their obſervations[w]. I acknowledge myſelf much obliged to each of theſe worthy gentlemen for the benevolence ſhewn me on this occaſion, and more particularly to D. Torên, who for the ſpace of three years made his obſervations on a tree of the ſame ſpecies with care and diligence; as alſo to D. Eric Ekelund, who did the ſame with the like induſtry for two years. Some perhaps had not always time, or opportunity to make their experiments with the ſame attention; for thoſe, who are detained in cities, often want a number of trees to obſerve theſe things as they ought, and thoſe, who live in the countrey, are often drawn by domeſtic affairs from things of this nature. But if obſervations were made according to the following rules. 1ſt, That they ſhould be continued for *three years*, and theſe ſpecified, as well as the *places* in every obſervation. 2d, That they ſhould be made on the

[w] The author gives in a note a liſt of eighteen perſons who had communicated their obſervations made in Sweden, Norway, Finland, and Lapland, ſome for one, ſome for two, others for three years from 1750 to 1752 both incluſive.

ſame *individuals*. And 3d, on trees which grow on the *ſame ſoil*, and in the *ſame expoſition*, as the *field* that is to be ſown. Were theſe circumſtances, i ſay, attended to, perhaps we might be able to form more certain rules for the uſe of the farmer; but ſince theſe rules have been ſometimes neglected, our buſineſs will not ſucceed ſo well; for who does not know that the *north wind*, *ſhade*, and a *moiſt ſoil* hinder the leafing of trees as much as a *dry ſituation* on the ſlope of a hill inclining to the ſouth promotes it? Beſides many errors have crept into theſe obſervations, e. g. ſome trees between whoſe leafing there ought not to intervene above two or three days, are often disjoined from one another by the interval of a fortnight; not to mention the order of leafing § 3, which trees ſcarcely, or rather never tranſgreſs, being tyed down to it by nature herſelf, but which often does not appear in theſe journals*.

* In the original there follows a ſection which i have not tranſlated. The intent of it is to explain a table giving an account of the different days of the foliation of ſome trees and ſhrubs in Sweden, Norway, &c. which i have omitted, as thinking it would afford little, or no entertainment to the reader.

§. 7.

§. 7.

If we conſider the year 1750, we may remember, that the winter was milder than ordinary, and the ſpring very early. Whence ſome in Upland ſowed their lands about the end of February; which they ſcarcely ever do in other years before April. I am not ignorant, that the lands in ſome of the northern provinces, eſpecially thoſe which abound in clay, require early ſowing, that the ground may be broken with leſs trouble, and that the firſt ſhoots of the barley may make their way thro' it before it grows ſtiff. But the people of Schonen, and others, that dwell near the ſea, ſow late, whether the ſpring be early or not; and that ſometimes to their great loſs, for no other reaſon but that they received this cuſtom from their anceſtors. The moſt northern inhabitants of Sweden find it neceſſary to ſow as ſoon as the froſt breaks up; that the ſhort ſummer may perfectly ripen the grain before the winter approaches. For as eggs require a fixed time for the excluſion of the young, ſo the barley does in different provinces, to ripen the ſeed. To prove this i will produce ſome examples.

		Sowing.	Harveſt.	Days.
Pithoa.	1740	June 4	Sept. 1	89
	1741	May 29	Aug. 31	94
	1742	27	29	94
	1743	27	26	91
	1744	31	26	87
	1745	24	27	95
	1746	26	25	91
	1747	28	23	87
	1748	June 4	22	79
	1749	May 21	22	93
	1750	19	14	87
	1751	21	11	92

		Sowing.	Harveſt.	Days.
Naſinge toward Norway	1750	April 20	Aug. 12	113
		May 4	7	95
		19	12	85
		21	14	85
		26	15	81
		June 13	25	73
			Medium	93
Korn an iſland of Bahus.	1731	May 28	Aug. 31	95
	1732	June 18	Sept. 14	88
	1734	May 9	Aug. 18	101
	1735	25	15	82
	1736	29	27	90
	1738	June 3	Sept. 5	94
	1739	May 8	3	118
			Medium	100

From theſe obſervations, which i have produced, and many others, i can conclude nothing at preſent, unleſs that the *ſowing of barley* nearly coincides with the *foliation of the birch*, at leaſt in Upland, and other places adjacent; and if this ſign is not to be depended upon every where, yet it would be eaſy for us, on a due examination, to find out ſome other

tree, more ſuited to this purpoſe; and which ſome provinces might uſe as a calendar, while the greateſt part might conſult the *birch*. It is a popular error, that leſs time paſſes between the ſowing, and ripening of wheat in our northern provinces, than here at Upſal, and that this happens becauſe the ſummer days are longer in the north, and there is ſcarcely any night to retard its growth. But this error is made evident by the grain ripening in as ſhort a time in Schonen as in Lapland. For barley in the champain part of Schonen is ſown about May the 29th, and reaped ſooner than in Upland. But why *barley* ripens later in Upland and Weſtmania, than in the other provinces of Sweden, is to me abſolutely a ſecret.

§. 8.

If a number of future obſervations ſhall confirm the doctrine which i have been delivering, i do not doubt but that we may reap many advantages from it. For then we ſhould not want a ſure guide for the huſbandman to regulate himſelf by in ſowing his grain, and for the gardener to ſow his kitchen, and other ſeeds. What great benefit therefore would ariſe to the

public, if one in every province would yearly make obſervations in this way, and at laſt communicate them in the ſame manner, as aſtronomers do their meteorological ones to the royal ſociety, or academy of ſciences?

It will beſides be neceſſary to remark what ſowing, made on different days in the ſpring, produces the beſt crop; that comparing theſe with the foliation of different trees, it might appear which is the moſt proper time for this purpoſe. In like manner it will not be amiſs to note at what time certain plants, eſpecially the moſt remarkable in every province, blow; that it might appear whether the year made a ſlower or a quicker progreſs. For we ſee, although obſervations of this kind have not yet come into uſe, that the mower can gueſs at the time proper for cutting graſs, either from the flowers of the *parnaſſia*, the *devil's bit*, the *marſh gentian*, or the *baſtard aſphodel* burſting forth, or from the flowers of the *purple meadow trefoil* withering, or from the ripening of the ſeeds of the *yellow rattle*, or in higher places from the yellow hue of the leaves of the *leopard's bane*. Would botaniſts like aſtronomers note the time of foliation, and flowering of trees and herbs, and the days on which the ſeed is ſown, flowers

and

and ripens; and continue theſe obſervations for many years, there can be no doubt, but that we might find ſome rule, from which we might conclude at what time grains, and culinary plants, according to the nature of each ſoil, ought to be ſown; nor ſhould we be at a loſs to gueſs at the approach of winter; nor be ignorant whether we ought to make our autumn-ſowing later or earlier. Laſtly, the gardener would have a more ſure prophet to conſult; whereas now he guides himſelf by nothing but very fallacious conjectures.

OF THE

USE of CURIOSITY.

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BY

CHRISTOPHER GEDNER.

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§. 1.

AS the three kingdoms of nature were created for the uſe of man, ſince to him alone is granted the prerogative of converting their inhabitants to his own advantage, ſo that part of knowledge which is converſant about the creatures throughout the terraqueous globe is the firſt, and chief by which men are enabled to provide themſelves with what is neceſſary, both for the preſent and future; and the more ſo becauſe, beſides theſe three kingdoms, and the elements there is nothing in

nature which can be of uſe to him. All thoſe things by which man is ſupported and grows, with which he is cloathed, and in which he prides himſelf, by which he is preſerved, and becomes inſolent; all the pomp, the ſplendor, the richneſs, the luxury of dreſs, as well as the neceſſary covering from hence have their origin. Without theſe things man muſt be as naked, as he was created, and came into the world. However obvious this truth may be, there is a common queſtion propoſed by the vulgar to men, who are buſied in examining the productions of nature, and that with ſome ſort of ſneer; *To what end are all theſe inquiries?* By which

ſelves up to the ſtudy of nature, and by its frequent repetition has at laſt quite worn out my patience. For which reaſon i think it will not be amiſs to conſider the queſtion, and prepare ſuch an anſwer to thoſe, who for the future ſhall not be aſhamed to urge over and over the ſame objections, as may convince them, if they will take the pains to read the few following pages, and conſider them thoroughly. All i deſire of the reader is a candid hearing.

§. 2.

The kind of men, who moſt frequently aſk this queſtion; *To what end all theſe inquiries?* are of a heavy, dull, and phlegmatic diſpoſition, of weak judgment, and low education. Amongſt ourſelves, in great cities, in large towns, and at academies, the ſearching into nature ceaſes now to be uncommon. Nor is this queſtion ever heard among men of ſolid learning. It is chiefly, and frequently put in the more remote provinces by the inferior order of people; who think of nothing but indulging their low appetites, and look on every thing as uſeleſs, which does not ſerve that purpoſe.

When electrical experiments firſt began to make a noiſe in the world, Samuel Klingenſti-

erna was ſent for by his majeſty Frederic the firſt to ſhew him ſome of the electrical phænomena. When all was over, a man of great rank, who happened to be one of the ſpectators on this occaſion, ſaid with a ſneer, " Mr. " Klingenſtierna, of what uſe is all this?" Klingenſtierna replyed with ſome acuteneſs; ' Sir, ' this very objection was made to me by J. C.' (this J. C. was a very rich dry ſalter). Upon which the king ſaid ſmiling, to the nobleman, i think he has given it you. Such men as theſe reſemble more the brute creation, than rational creatures. They do not conſider, that the allwiſe Creator made every thing for man's uſe. They forget that every thing which was created at the beginning was declared to be good. To theſe men whatever is curious is diſguſtfull, and inquiries into nature are deemed mere folly.

Ternſtôm (Chriſt.) when he went with the Oſtend fleet to the Eaſt Indies, was treated with contempt by ſome of the company for his curioſity *. They thought nothing of conſequence, but what belonged to the winds, and waves.

* Bellonius in his Obſervations, p. 3. ſays the ſame happened to him.

Bart-

Bartſcius (John) when he arrived at Surinam, where he went in order to make obſervations in natural hiſtory, was deſpiſed for looking after plants, and inſects. The inhabitants there thought nothing worth minding, but what belonged to *ſugar* and *coffé* plantations. Vid. his letters to Linnæus.

Profeſſor Kalm dared not at the hazard of his life let the ſavages of Canada, amongſt whom he reſided, know that he deſcribed any plant or other natural object, but was forced to carry on all his reſearches in private.

When our preſident was gathering, and deſcribing the *rhen-deer-fly* on the Lapland mountains, the inhabitants wondered, and laughed at him for troubling his head about catching inſects. Vid. Act. Stockhol. vol. 1. p. 121. And we find that he, and his companions were ſtared at as a ſpectacle in his journey through Oeland. It. Oeland. p. 85. 109.

Dr. Haſſelquiſt was forced to have a guard whenever he went out of Cairo in order to deſcribe any natural object; and even then he was not quite ſafe from the vulgar on account of his curioſity. Theſe examples may ſuffice without producing any more.

§. 3.

We were created for the glory of the Creator, which cannot be brought about, unleſs we know him, either by revelation, or the works of the creation. As to the latter, i ſuſpect, that many come into the world, and remain here even to old age, who never ſaw the creation, but from afar; juſt like the brute beaſts, which cannot fail of ſeeing the verdure, and various colors, that cloath the earth, but go not one ſtep farther. This ſeems to me as if any one, who ſhould be carried into a botanic garden to ſee the immenſe variety of plants brought together from all parts with incredible trouble, care and expence, ſhould only obſerve that the leaves were green, and the flowers of various colors, juſt as they are every where elſe. Could ſuch an one be truly, and juſtly ſaid to have ſeen the garden? Or if any one ſhould go into a muſeum, filled with natural objects of the rareſt kind preſerved in ſpirits of wine, and ſhould only attend to the clearneſs of the liquor, and, though he ſaw a body hanging in it, ſhould not inquire what body it was; would not he, who took the trouble of ſhewing theſe ſights to ſo curious a

perſon,

perſon, think his time thrown away? Would ſuch a ſpectator deſerve to be let into ſuch a place?

I cannot help on this occaſion calling to mind the manner, in which our preſident uſed ſometimes to excite attention in his audience by an apt ſimilitude, when he was reading upon *inſects* to his pupils. The ſimilitude or rather fable was as follows. 'Once upon a time 'the ſeven wiſe men of Greece were met toge-'ther at Athens, and it was propoſed that every 'one of them ſhould mention what he thought 'the greateſt wonder in the creation. One of 'them, of higher conceptions than the reſt, 'propoſed the opinion of ſome of the aſtrono-'mers about the fixed ſtars, which they believed 'to be ſo many ſuns, that had each their pla-'nets rolling about them, and were ſtored with 'plants and animals like this earth. Fired with 'this thought they agreed to ſupplicate Jupiter, 'that he would at leaſt permit them to take a 'journey to the moon, and ſtay there three days 'in order to ſee the wonders of that place, and 'give an account of them at their return. Ju-'piter conſented, and ordered them to aſſemble 'on a high mountain, where there ſhould be a 'cloud ready to convey them to the place they

'desired to see. They picked out some chosen 'companions, who might assist them in describ-'ing, and painting the objects they should meet 'with. At length they arrived at the moon, 'and found a palace there well fitted up for 'their reception. The next day, being very 'much fatigued with their journey, they kept 'quiet at home till noon; and being still faint 'they refreshed themselves with a most delici-'ous entertainment, which they relished so well, 'that it overcame their curiosity. This day they 'only saw through the windows that delightfull 'spot, adorned with the most beautiful flowers, 'to which the beams of the sun gave an uncom-'mon lustre, and heard the singing of most me-'lodious birds till evening came on. The next 'day they rose very early in order to begin their 'observations; but some very beautifull young 'ladies of the country, coming to make them a 'visit, advised them first to recruit their strength 'before they exposed themselves to the labori-'ous task they were about to undertake.

'The delicate meats, the rich wines, the 'beauty of the damsels prevailed over the re-'solution of these strangers. A fine concert of 'music is introduced, the young ones begin to 'dance, and all is turned to jollity; so that this

'whole

'whole day was ſpent in gallantry, till ſome of 'the neighbouring inhabitants, growing envi-'ous at their mirth, ruſhed in with drawn 'ſwords. The elder part of the company tryed 'to appeaſe the younger, promiſing the very 'next day they would bring the rioters to 'juſtice. This they performed, and the third 'day the cauſe was heard, and what with accu-'ſations, pleadings, exceptions, and the judg-'ment itſelf the whole day was taken up, on 'which the term ſet by Jupiter expired. On 'their return to Greece all the countrey flocked 'in upon them to hear the wonders of the moon 'deſcribed, but all they could tell was; for 'that was all they knew; that the ground was 'covered with green, intermixed with flowers, 'and that the birds ſung amongſt the branches 'of the trees; but what kinds of flowers they 'ſaw, or what kinds of birds they heard, they 'were totally ignorant. Upon which they were 'treated every where with contempt.' If we ap-ply this fable to men of the preſent age, we ſhall perceive a very juſt ſimilitude. By theſe three days the fable denotes the *three ages* of man. Firſt *youth*, in which we are too feeble in every reſpect to look into the works of the Creator. All that ſeaſon is given up to idle-

idleneſs, luxury and paſtime. 2dly. *manhood*, in which men are employed in ſettling, marrying, educating children, providing fortunes for them, and raiſing a family. 3dly. *old age*, in which, after having made their fortunes, they are overwhelmed with lawſuits, and proceedings relating to their eſtates. Thus it frequently happens that men never conſider to what end they were deſtined, and why they were brought into the world.

§. 4.

As to bodies, the vulgar are ready enough to admire them in the larger kinds of animals, plants, minerals and metals. But when they perceive any one examining into the minute parts of nature, ſuch as *inſects* and *ſhells*, *graſſes*, and *moſſes*, *earthy particles*, and *petrifactions*, they look upon it as idle curioſity. And when they ſee us ſearching after ſuch natural productions of foreign countries, as are not found with us, their wonder increaſes, and they think then they attack us with double advantage. Since we not only ſpend our time in examining preſent objects, that are wholly uſeleſs, but even ſuch diſtant ones, as we have ſcarcely any means of coming at. They have

have no notion that theſe can be of any manner of uſe but to thoſe amongſt whom they are found. To the end therefore that we may gain a clearer conception of the harmony, and uſe of theſe things, it will be neceſſary to run thro' ſome of the moſt obvious particulars, relative to this ſubject, that every one from hence may better comprehend the advantage of natural hiſtory in general.

§. 5.

The antients were of opinion, that the bodies about us concerned us no farther than as they were good for *food* or *phyſic*. Hence their inquiries all tended to find out what were fit to eat, and what would cure ſome diſtemper, and whatever plant or animal could not be referred to one of theſe claſſes was neglected[y]. It is true that the immediate uſe of many

[y] I muſt take the liberty to contradict the ingenious author on this occaſion. For any one who has ever looked into Ariſtotle's hiſtory of animals, and Theophraſtus's of plants, muſt at once be convinced of the contrary. This juſtice i thought due to thoſe two firſt ſketches of natural hiſtory, in which the ſagacious and extenſive genius of the maſter, and the diſciple fully ſhine forth. It is true this ſpirit was not long kept up, nor is it to be wondered at, that extravagant ſpeculations, and ſyſtems concerning things out of

many bodies is hitherto unknown to us, yet we have great reaſon to believe, that all the bodies in the univerſe, ſome way or other, contribute to our advantage. *Hay*, which men take ſuch pains to collect in the ſummer, is of no uſe to man immediately, but it is a commodity of the utmoſt conſequence to him mediately, as being the food of cattle of all ſorts, without which we could not well ſubſiſt. Thoſe minute inſects called *tree lice*, that live upon the branches of trees, and plants, are looked upon as of no uſe to us. Theſe are devoured by *flies*, *cochineals*, *golden eyes*, &c. in their firſt ſtate; which alſo ſeem to be of no uſe to us, but then many of the *ſmall birds* feed upon

of mens reach, which are purſued in the cloſet with eaſe, and when ingenious are apt to ſtrike the imaginations of mankind, ſhould take place of the ſober, and painful reſearches into nature, little minded by the generality of people, and therefore lying out of the paths of reputation. Thus what was ſo well begun by Ariſtotle and Theophraſtus dropped at once for want of encouragement, and never raiſed its head again, till after the reſtoration of learning; when Geſner, Bauhin, Cæſalpinus, &c. in imitation of thoſe firſt maſters, began to revive this part of knowledge; and kindled up a ſpark which has never been totally extinguiſhed ſince, and has been raiſed into a diffuſive light by ſeveral naturaliſts of the laſt age, and particularly by the excellent Linnæus.

them,

them, and theſe not only delight us with their fine ſongs but afford us moſt delicate food. The *nettle* is a plant which is ſcarcely eat by any domeſtic animal (Iter. Scand. p. 15.) but the Author of nature has allotted to it more feeders than to almoſt any other plant, v. gr. *butterflies*, *moths*, *wevils*, *chermes*, &c. which devour it almoſt entirely, and theſe inſects are a prey to many birds, which could by no means live on the plant immediately. *Minute aquatic worms*, and thoſe in no ſmall number, are eat by the larger, and theſe are eat by the fiſhes, and aquatic birds, and theſe by us; and beſides food theſe birds ſupply us with moſt delicate ſoft down to warm and repoſe ourſelves upon. It would be tedious to enumerate all the mediate advantages, which we obtain from the moſt contemptible; as they are deemed; both plants and animals.

§. 6.

Many look upon *ſhells* and *corals* of various kinds, which are collected and ranged in muſeums by the diligent inquirers into nature, as an idle curioſity; ſince they neither ſerve for food or phyſic: but if theſe are neglected, how many of the wonderfull works of the Creator would

would be unknown? What man of ſenſe is not ſtruck with wonder, when he beholds the innumerable objects, which the author of nature has buried, as it were, in the great abyſs. Objects for color, ſhape, and mechaniſm ſo admirable, that they ſurpaſs the imagination of man to conceive without ſeeing them. If we viſit a royal palace, and there behold the walls covered with tapeſtry, pictures, ſculpture, and other ornaments, are we not delighted, and even in rapture? We ought therefore to feel the ſame pleaſure, when we behold the beauties of this our globe. To deſcribe every ſhell on this occaſion would far exceed the bounds of my deſign. At preſent i will only mention one, viz. the *knotted marginated Cypræa*. Rump. t. 39. f. C. Argenvnill. t. 21. f. K. Petiv. Faz. 97. t. 8. This is a ſmall ſhell, about the bigneſs of a hazel nut, and is gathered in the Maldivee iſlands by the women along the ſea ſhore in ſuch quantities, that 30 or 40 ſhips are loaded with them yearly for Africa, Bengal and Siam; ſo that in thoſe parts there are large palaces filled with them, where they are preſerved as treaſures of the greateſt value.

Theſe ſhells ſerve there as gold and ſilver with us, for all kinds of commerce. In other coun-

countries other ſhells are made uſe of for various purpoſes; ſome inſtead of horns to blow with at their religious ceremonies; ſome for veſſels for waſhing; ſome for cups; ſome for boxes; ſome for inlaying; all of them far exceeding the beſt artificial works.

Nor are thoſe innumerable *petrifactions*, ſo various in ſpecies, and ſtructure, to be looked upon as vain curioſities. We find in our mountains, and even in the middle of ſtones, as it were embaumed, *animals*, *ſhells*, *corals*, which are not to be found alive in any part of Europe. Theſe alone, were there no other reaſon, might put us upon looking back into antiquity, and conſidering the primitive form of the earth, its increaſe, and metamorphoſis. This is a ſubject, that would require a whole volume to treat it amply as it deſerves.

Wild beaſts, and *ravenous birds*, though they ſeem to diſturb our private œconomy, are not without their uſes, which we ſhould be ſenſible of, if they were extirpated [z]. When

[z] Thus in Suffolk, and in ſome parts of Norfolk, the farmers find it their intereſt to encourage the breed of rooks, as the only means to free their grounds from the grub, from which the tree or blind beetle comes. Vid. Liſter's Goedart. p. 265. pl. III. Scarabæus. Melolontha. 6. N. 10. p. 351. which in its grub ſtate deſtroys the roots of corn and

When the *little crow* was driven out of Virginia, and that at the expence of ſeveral tuns of gold, the inhabitants would willingly have brought them back again at double the price, as we find by profeſſor Kalm. The *vultures* in Cairo are invited yearly, and daily to remain there, as doctor Haſſelquiſt relates in Act. Sac. reg. Scient. Stockhol. 1751. p. 196. et ſequ. Theſe creatures of prey cleanſe the ground from carcaſes, and make it wholeſome, and pure, and beſides they ſerve to keep up a due proportion between animals, ſo that one ſort may not ſtarve the reſt.

The vulgar think, and thoſe who think themſelves wiſer than the vulgar, make no ſcruple to ſay; *let him who has nothing to do employ himſelf in hunting after moſſes and flies.* By which they would inſinuate that ſearching after the minute plants, and animals is unbecoming, or at leaſt unneceſſary for a ra-

and graſs to ſuch a degree, that I myſelf have ſeen a piece of paſture land, where you might turn up the turf with your foot.

Mr. Matthews, a very obſerving and excellent farmer, of Wargrove in Berkſhire, told me that the rooks one year, while his men were houghing a turnep field, ſat down in part of it, where they were not at work, and that the crop was very fine in that part; whereas in the other part there were no turneps that year.

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tional creature. As for *moſſes*, i grant we have not authority on our ſide: for till the end of the laſt century, they were almoſt wholly neglected; but now within theſe fifty years their hiſtory is very near compleat by the diligence of Dillenius. C. Bauhin knew very few *moſſes*; Dillenius has deſcribed near 600. With unwearied pains he went through this very difficult, and extenſive branch of natural hiſtory. But to what end? it is aſked. I will not take upon me to anſwer this queſtion by ſhewing the particular uſe of every *moſs* that grows; although i am certain the Lord of nature has made nothing in vain. But i will venture to aſſert, that poſterity will, one time or other, find as many advantages ariſing from *moſſes*, as from other vegetables. I aſſert this with the greater confidence, becauſe ſince our acquaintance with *moſſes*, we have many experiments, which ſhew their uſefulneſs, a few inſtances of which i ſhall ſubjoyn. The *bog moſs* covers deep bogs with its ſpongy ſubſtance, and thus by degrees turns them into fertile meadows; not to mention its repelling virtue in medicine; at preſent alſo its turf is uſed inſtead of wood in many provinces, and it is a cuſtom eſtabliſhed among the workers in metals to burn it in-

to cinders in their forges. The Laplanders, who lay their children upon it in the cradle, find that it abates the acrimony of the urine. Act. Stock. 1740. p. 421.

The *fontinalis antipyretica*, a kind of *moſs*, contrary to the nature of all other *moſſes*, guards the walls of houſes in caſe of fire. It. Scand. p. 20.

The *maiden-hair* furniſhes a very convenient bed to the Laplander, and the *bear* with this prepares his winter habitation. Moſt of our *tumps* conſiſt of this kind of *moſs*.

The *club-moſs* is uſed for making mats.

The *cypreſs-moſs* furniſhes a yellow dye.

The upright *fir-moſs* frees cattle from vermin, and purges ſtrongly. It. Oel. p. 28.

The *fountain-moſs* points out cool ſprings.

The *hypnum proliferum*, a kind of *moſs*, covers the ground in ſhady places, where no other plant will grow. Iter. Oeland. p. 28.

The *hypnum parietinum* ſerves for ſtopping creviſes in walls.

All the kinds of *hypna* and *brya* [a] cover the earth with green, and keep it from being quite naked, as in beech groves and in the woods of both the Indies. They preſerve the minute ſeeds of plants during the winter, ſhelter their

[a] Names of *moſſes*.

roots

roots and keep them from freezing; and gardeners gather *moſſes* in the autumn, in order to preſerve their plants from the froſt; they are gathered by the birds to build their neſts; they grow in the moſt barren ſoil; by degrees they rot towards the bottom, and thus lay a foundation for fertility.

The *bryum hypnoides* covers the rocks in the coldeſt mountains.

The *mnium hygrometricum* ſhews the drineſs, and moiſture of the atmoſphere.

Some kinds of *brya* cover the mountains, others the marſhes, ſome are uſefull in moiſt meadow ground, ſome ſpread over the naked fields, ſome are found upon ſtones, and rocks, others on trunks of trees; and all of them bear the moſt ſevere winter, when the generality of other plants grow ſickly.

§. 7.

As to the *lichens* or *liverworts*, they are not of leſs uſe; for many of them afford a beautifull dye. e. g. the *roccella* yields a moſt valuable red color, Act. Soc. reg. Scien. 1742. p. 21. to which purpoſe the *lichen tartareus* ſerves as a ſuccedaneum. The *lichenes ſtygius*, *onuphalodes*, &c. afford alſo a red dye, and the

lichenes croceus, *vulpinus* a good yellow. There is no doubt, but that many colors in proceſs of time may be obtained from this kind of plants.

If we conſider the vertues of the *lichenes* or *liverworts* upon animate bodies taken internally, they are not inconſiderable. The *lichen vulpinus* is a deadly poiſon to wolves. It. Scan. p. 40. The *lichen pyxidatus*, or *cup-moſs*, is efficacious in the hooping cough. The *lichen jubatus*, or *rock-hair* in exulcerations of the ſkin. The *lichen omphalodes* in ſtopping hæmorrhages. The *lichen aphthoſus* in thruſhes, and againſt worms. The *lichen caninus* or *aſh-colored ground liverwort*, in the hydrophia and madneſs. The *lichen pulmonarius*, or *lungwort*, is found to be good in conſumptions. The œconomical uſe of the *lichens* is of no ſmall conſequence. e. g. the *lichen rangiferinus* affords the moſt delicious paſture to the rhen-deer. Upon this the whole œconomy of the Laplander turns, and by the help of this, many millions of men are ſupported. This *lichen* is alſo given to other cattle by the people of Norland. Act. Soc. reg. 1742. p. 153. Some of the kinds of *lichens* are the delight of *goats*. The moſt barren woods, where no other plants grow, afford us

the

the *lichen iſlandicus*, which in times of ſcarcity ſerves inſtead of bread. Act. Soc. reg. Sc. 1742. p. 164.

The *lichen prunaſtri*, or *plumb-liverwort*, is ground to powder for the hair.

The *lichen puſtulatus* may be converted into a very black pigment. The very *ſmall lichens*, called *leproſus*, cover barren rocks, and makes them look pleaſant; it gives birth to black mould, and conſequently affords the firſt degree of vegetative power. After all this can any one juſtly ſay that the knowledge of theſe plants is uſeleſs?

The *muſhroom* kind alſo make a claſs of vegetables by no means to be deſpiſed. One ſpecies is uſed in amputations and hæmorrhages, and another is lately come into reputation for ſtopping the bleeding of arteries; inſomuch that the inventor of this uſe of it, was amply rewarded for the diſcovery.

The *truffle* and *phalli* contribute to make our ſoups more delicate, and are commonly uſed at the tables of the great, Many *muſhrooms* are eat by the Muſcovites and the inhabitants of other countries, but ſome of them are a moſt deadly poiſon, ſo that it is of the utmoſt conſequence not to commit miſtakes in this part of knowledge.

There is a *muſhroom* called *agaricus muſcarius*, on account of its driving away flies, and the ſame plant is the ſafeſt remedy hitherto diſcovered to deſtroy the *bug*. Thus the knowledge of theſe plants is of great uſe to man.

§. 8.

* The *graſſes* alſo are a kind of plants of great value, as affording food for cattle.

The *reed canary graſs* ſerves for thatching houſes.

The *meadow fox-tail graſs* is an excellent *graſs*, which may be ſown to advantage in low meadows. It. Oel. p. 156.

The *turfy-hair* cauſes the meadows in the regio cuprimontana to be ſo extremely fertile. Act. Soc. R. S. 1742. p. 30.

The *water meadow* is a large and very uſeful *graſs*, which grows by the ſides of moſt ditches and rivers. It. W. Goth. p. 41.

The *narrow-leaved meadow* is the moſt common paſture in our parts.

The *ſeed of the flote* or *manna graſs*, affords a very pleaſing and wholeſome nouriſhment to man.

* Who is curious to know more of theſe graſſes may conſult the laſt piece in the book, intitled, *Obſervations on graſſes*.

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The *ſheep's feſcue* makes our ſheep very fat.

The *perennial darnel* is the beſt *graſs* for *hay* on chalky hills.

The *ſea lyme-graſs* and *ſea mat-graſs* keep the ſands on barren maritime tracts from being blown away.

The moſt minute ſeeds of *graſs* afford nouriſhment to ſmall birds. The *graſſes* beſides give a moſt agreeable color to the earth, and fill up the intervals between plants of other kinds; ſo that they ſerve both for pleaſure, and utility. The Creator has aſſigned certain ſpecies of *graſs* to every different ſpecies of ſoil, which the huſbandman is obliged to know in order to make the moſt advantage of his lands. Beſides certain *graſſes* are eat by ſome animals, and left untouched by others; ſo that without the knowledge of theſe he cannot avoid falling into error. It. Scand.

§. 9.

He that would exerciſe the art of huſbandry with the greateſt advantage, ought to endeavor to get acquainted with all kinds of vegetables, and find out what ſort of ſoil ſuits each of them beſt. He ought to know, that ſome delight in open and expoſed ſituations, others in ſhady; ſome in moiſt ground, others

in dry; that ſome plants thrive moſt in ſandy ſoils, others in claiey, others in black mould, others in ſpungy ground, others in watry; ſome ought to be ſown in pools, others on the tops of hills.

Thoſe barren deſarts called Alvacu on the mountains of Oeland, It. Oel. p. 206. had long ago been covered with the *crocus*, from whence the inhabitants might have reaped great benefit, if the nature of that plant had been known to them. Our alps, that are more than a hundred miles long, had not remained to this day a mere waſte, if our induſtrious huſbandmen, who not long ſince began to improve the œconomical arts, had known how to cultivate ſuch plants as might have been uſefull in food, or phyſic; and if they had known what uſefull trees, and herbs grow on the forreign alps, viz. the Swiſs, the Sibirian, the Pyrenean, the Valeſian, &c. from whence they ought to have got ſeed.

The banks of our lakes produce ſcarcely any thing but *ruſhes*, *horſetail*, *water lilly*, *pondweeds*, *reeds*, &c. where nevertheleſs a great number of plants fit for food might be ſown, ſuch as *zizany* of Canada, *water caltrops*, &c.

Every province has its plants, which choak the

the grain, and render the fields foul, and poor. It. Scand. p. 421. Books of huſbandry are full of inventions how to break the earth by inſtruments, and fit it to receive the ſeed; this kind of knowledge is inſufficient, as long as the huſbandman is unacquainted with the nature of thoſe various herbs, to which agriculture ought to be adapted. From hence the neceſſity of natural hiſtory appears.

§. 10.

It is alſo neceſſary for the huſbandman to know the duration of every plant he ſows in his fields, and meadows, viz. whether it be perennial, biennial, or annual. He who wants to know the uſe of our plants in œconomy, and how few there are, whoſe uſe is hitherto diſcovered, let him look over the *Flora œconomica*. Amæn. Academ. vol. I *.

We ſee how many in a time of dearth ſuffer for want, fall into diſeaſes, and even periſh,

* The piece here referred to is full of new obſervations on the uſes of plants hitherto not attended to. I wiſh I could have made ſuch a tranſlation of it, as could have been inſtructive or entertaining to the public; but a long liſt of the names of plants, which could have conveyed no ideas to ſuch readers as this work is intended for, muſt have been very tedious, and very uſeleſs.

for

for no other reaſon but becauſe they do not know what plants are eatable, and how great a plenty there is of them in our countrey, of which D. Hiorth in this volume has given an account, which the moſt illuſtrious ſenator Baron Lowenheilm has tranſlated into Swediſh. Many people wonder why the curious enquirers into nature will give themſelves ſo much trouble about exotic plants; but they do not ſufficiently conſider, that many kinds of *grain*, many *roots*, *legumes*, *fruits*, *ſallads*, and *trees* in common uſe with us for nouriſhment, houſehold utenſils, cloathing, and ornament are originally exotics. Here follows a liſt of ſome, which have lately been brought into our countrey from the farthermoſt parts of Sibiria, that contribute to adorn our gardens, and change our œconomy.

Larkſpur, *monks-hood*, *adonis*, *vetch*, *cow parſnep*, French *honey-ſuckle*, *aſtragalus*, *othonna*, *baſtard-ſaffron*, *greater centory*, *colombine*, *dracocephalon*, *ſpeedwell*, *claytonica*, *flax*, *hyacinth*, *lilly*, *lychnis*, *poppy*, *cat-mint*, *yellow-flowered ſage*, *hooded willow herb*, *hyſſop*, *wild navew*, *St. John's wort*, *ſow-thiſtle*, *ſaw-wort*, &c. From that diſtant countrey we have the *robinia's*, and a *honey-ſuckle*, that make excellent quick-hedges; from

from thence we have the Sibirian *nettle*, that ſerves for making ſacks. If we had a more compleat knowledge of plants, that grow in the ſouthern parts of Aſia, and America, we ſhould be able to make more ample and uſefull experiments.

To preſerve our woods we want to be provided with quick-hedges, for which purpoſe many kinds of trees are ſerviceable, ſuch as the *gooſeberry-buſh*, the *black-thorn*, the *white-thorn*, the *barberry*, the *ſea buck-thorn*, the *alder*, the *ſallow*, &c. provided each be planted in a proper ſoil.

§. II.

We have ſome of our moſt efficacious medicines, and beſt ſpices from the ſouthern parts of the world; and were it not for the curious in botany they had been neglected; as the *lignum colubrinum* was for a long time. What end would it ſerve to know, that the *ſenega root* was good againſt the bite of ſerpents, unleſs botaniſts had alſo known the plant? And who would ever have dreamed, that our *milk-wort* would anſwer the ſame intent? What end would it have ſerved, that profeſſor Kalm was

witneſs to the efficacy of the Virginia *avens* and the *monacda* in intermitting fevers, and of the root of the *ceanothus*, and *diervilla* in venereal caſes; if we had not learned how to raiſe theſe plants? Or to what end would it have ſerved to croſs the ocean, and attain the American *water gladiole*, if we had not found out that it was of the genus of our *water gladiole?* The Europeans at vaſt expence went on buying the *moxa* from China, the *figwort* from Brazil, and the *jachaſchapuch* from North America, till it was known that they grew in our own countrey.

§. 12.

There is, as it were, a certain chain of created beings, according to which they ſeem all to have been formed, and one thing differs ſo little from ſome other, that if we fall into the right method we ſhall ſcarcely find any limits between them. This no one can ſo well obſerve, as he who is acquainted with the greateſt number of ſpecies. Does not every one perceive that there is a vaſt difference between a ſtone and a monkey? but if all the intermediate beings were ſet to view in order, it would

would be difficult to find the limits between them. The *polypus* and the *moſs* joyn the vegetable, and the animal kingdom together, for the plants called *confervæ* and the animals called *coralline*, are not eaſy to diſtinguiſh, and the *corals* connect the animal, vegetable, and foſſil world.

Hence the botaniſts of this age have been buſied about ſettling natural claſſes, which is an affair of the greateſt importance, and difficulty; but ſince the vegetables hitherto diſcovered are not ſufficient for that purpoſe, this part of knowledge is not compleat. It is therefore incumbent on botaniſts to get acquainted with exotic plants, that they may arrive at the end deſired. If all the *columniferous* plants except the *muſk-mallow* were known, the *turnera* never could be referred to this order, but that, as ſoon as it was examined, connected the *turnera* with the *columniferous* plants.

Where the natural claſſes are ſettled we find the vegetables ſo near akin to one another, that we can ſcarcely diſtinguiſh them, as in the *umbellated*, the *filiquoſe*, the *leguminoſe*, the *compoſite*, &c. moſt of theſe orders grow in Europe,

Europe, and therefore could be eaſily known, and ranged.

He that knows but a few plants gives characters, which are eaſy to find out, but are inſufficient to ſettle any thing; and therefore tend to confound, rather than to advance knowledge; ſo that the natural method is the ultimate end of our ſyſtematical inquiries. Without this all is a mere chaos, and if the knowledge of vegetables fails, all that uſe of them is gone, which the learned in this way might diſcover to the great benefit of mankind.

It is true indeed that vegetables act upon the human body by ſmell, and taſte; but theſe marks are not ſufficient unleſs we know the natural orders of plants.

Theſe being known, and the vertues of ſome vegetables being diſcovered, we may go on ſafely in the practice of phyſic, otherwiſe not. It follows from hence, that he who deſires to make any conſiderable improvement in this branch of knowledge, muſt endeavor to get acquainted with thoſe plants, whoſe uſe he does not know; and thus he is obliged not to neglect the moſt contemptible. e. g. no body

was

was able to form a right judgment of the *caſcarilla*, who did not know its natural order. No phyſician would have even ſuſpected, that our *milkwort* would be uſefull in the bite of ſerpents, and inflammatory fevers, unleſs the principles of botany had led him to it. No one has even thought of trying the *mitreola Americana* againſt the bite of ſerpents, which yet, without ever ſeeing it, we may certainly conclude to be efficacious in thoſe caſes, from the *ophiorrhiza Aſiatica*, or *true lignum colubrinum* [b]. When botaniſts knew the above-mentioned *turnera*, but were ignorant to what natural claſs it ought to be referred, no man could

[b] This root is known in the Eaſt-Indies to be a ſpecific againſt the poiſon of that moſt dreadful animal called the *hooded-ſerpent*. There is a treatiſe in Amæn. Acad. vol. 2. upon this ſubject, wherein the author Joh. And. Darelius undertakes, from the deſcription of ſuch authors as had ſeen it upon the ſpot, to aſcertain the plant from which the genuine root is taken. It appears in this account that it had puzzled the European phyſicians, and what had been ſold in the ſhops for it is the root of a very different plant, and of a poiſonous nature.

The true root is called *mungos* for the following reaſon. There is a kind of *weeſel* in the Eaſt-Indies called *mungutka* by the natives, *mungo* by the Portugueſe, and *muncas* by the Dutch. This animal purſues the *hooded-ſerpent*, as the *cat*

could gueſs its vertues. But now that we know, that it is of the *columniferous* order, we may without experience be aſſured that it is of the emollient kind.

Without this knowledge of the natural orders, the *materia medica* would ſtill be as uncertain, as amongſt the antients, which is of the utmoſt importance to us if life and health be ſo.

§. 13.

We are ready enough to put a due value on the larger animals, but many look on the minute tribe of inſects, rather created to torment, than to be uſefull to mankind. We

cat does the *mouſe* with us. As ſoon as this *ſerpent* appears the *weeſel* attacks him, and if ſhe chances to be bit by him, ſhe immediately runs to find a certain vegetable; upon eating which ſhe returns, and renews the fight. The Indians are of opinion, that this plant is the *mungos*.

That celebrated traveller Kæmpfer, who kept one of theſe *weeſels* tame, that eat with him, lived with him, and was his companion, wherever he went, ſays he ſaw one of theſe battles between her and the *ſerpent*, but could not certainly find out what root the *weeſel* looked out for. But whether the *weeſel* firſt diſcovered this antidote, or not, yet it is certain, adds Darelius, that there is a root, which is an infallible remedy againſt the bite of the *hooded-ſerpent*. And this he undertakes to aſcertain.

grant

grant that they are very troubleſome to us. But is therefore all care about them to be given up? by no means. On the contrary we ought to contrive means to get rid of them, that they may not deſtroy both us and our poſſeſſions. This cannot be brought about unleſs we know their nature; when that is known we ſhall more eaſily find out remedies againſt them [c]. The uſe of inſects has been ſufficiently explained by the noble Carolus de Geer, lord of the bed-chamber to his majeſty, in an oration which he made in the academy of ſciences at Stockholm. Another of my fellow-ſtudents has undertaken to explain what damages inſects of various kinds do us, and another now is actually employed in ſhewing what kind of inſects live

[c] We have lately had a proof that the knowledge of the nature of inſects may ſometimes be ſerviceable to us. The ſagacious Dr. Wall of Worceſter, upon ſeeing the caſe of the Norfolk boy, who was cured of worms by taking down a large quantity of white lead, and oyl, gueſſed that the cure was performed by the oyl, knowing that oyl is fatal to worms and other inſects. Upon this he has ſince tryed oyl in worm-caſes with a great appearance of ſucceſs, an account of which i ſaw in a letter from him to be communicated to the Royal Society. That oyl is deſtructive to worms was known to the antients, as appears by Ariſt. Vid. Hiſt. Anim. lib. 8. c. 27.

upon every plant [4]. This makes it unneceſſary for me to enlarge at preſent upon the almoſt incredible miſchief inſects do us. I will only in a very few words mention, that we ſhall never be able to guard ourſelves againſt them, but by their means. For as we make uſe of *dogs*, and other beaſts, in hunting down *ſtags*, *boars*, *hares* and other animals, which do us much damage in our fields and meadows; or as *hawks* may be bred up ſo as to aſſiſt us in taking *herons*, *larks*, and other birds, ſo alſo we might make uſe of the fiercer kinds of inſects, in order to get the better of the reſt of theſe troubleſome animals.

We ſhall never be able to drive *bugs* out of our houſes, before we introduce other inſects that will devour them, v. g. the wild *bugs*, &c.

We have no eaſier method of deſtroying *knats* and *flies* which cauſe us ſo much diſturb-

[4] The two laſt-mentioned perſons hinted at are, I imagine, J. G. Foſkahl, and M. Backner, the firſt of whom has written a treatiſe ſhewing the plants which different inſects live upon, the laſt a treatiſe on the miſchiefs done by inſects. Both theſe are publiſhed in Amæn. Acad. V. 3.

ance, than by providing ourſelves with the *libellula*, which devours them, as the *kite* does poultry. We oftentimes find our largeſt trees entirely ſtripped of their leaves by the *caterpillars* of the *moth* kind, &c. but when we ſearch after them we find they are all eat up by the larger kind of *carabi* called *ſycophantæ*; from whence we may learn, that there is no remedy more efficacious in our gardens, where leaves, flowers, and fruits are almoſt every year deſtroyed by thoſe *caterpillars*, than gathering and preſerving the above-mentioned *carabi* till they lay their eggs, and then placing them at the roots of trees in rotten wood, till they are hatched. And thus we ſhould effectually guard our trees from theſe inhoſpitable gueſts.

§. 14.

But if we do not think it worth our while for any other reaſon to turn our attention to the works of nature, yet ſurely for the glory of the great Creator we ought to do it, ſince in every plant, in every inſect we may obſerve ſome ſingular artifice, which is not to be found in any other bodies; and upon comparing

theſe together, we may be convinced, that this does not happen by chance, but was contrived for ſome certain end, viz. either the propagation, or preſervation of the plant or animal with reſpect to thoſe other bodies. We find how many plants are fenced againſt the inclemencies of the elements, and the devaſtations of animals; and how every animal is furniſhed with ſome means, by which it may defend itſelf againſt the depredations of the reſt; ſo that no ſpecies can ever totally periſh, which has been created.

Laſtly, from the contemplation of nature we may ſee, that all created things ſome way or other ſerve for uſe; if not immediately, yet by ſecond or third means. Nay we may ſee, that what we imagine to be moſt noxious to us is not ſeldom highly uſefull. Without ſome of theſe things our œconomy would ſuffer extremely. Thus were there no *thiſtles* or *briars*, the earth would be more barren. We ought not to overlook the minuteſt objects, but examine them with the glaſs; for we ſhall then perceive how much art the Creator has beſtowed upon them.

He who beholds one of the *jungermanuiæ*, a kind of *wrack*, with a microſcope, muſt be forced

forced to confeſs, that he beholds a moſt ſtupendous, and wonderful phænomenon. Many thouſands of people are ſupported by rye-bread, not one of them perhaps ever ſaw, in how ſurpriſing a manner its huſks are armed; which any one, who is deſirous, may ſee by the help of a glaſs.

The day would ſooner fail me than matter, were i to take notice of every thing which this ſubject affords. Let this then be looked upon as the end of created beings; that ſome may be uſefull to man as phyſic, others as aliment; ſome in œconomy immediately, others mediately; ſome vegetables prepare the ground, ſome protect thoſe which are more tender, others cover the earth with a green, and moſt beautifull tapeſtry, and that perennial; ſome form thoſe groves to which we fly for coolneſs, others adorn our globe with their moſt elegant flowers, and regale our noſtrils with their moſt delicious odors. Laſtly, all things demonſtrate abundantly the omniſcience of the wiſe Creator, who created nothing in vain, but contrived every thing with ſo much artifice, that human art, however great it may be, cannot imitate the leaſt of his productions. If we neglect therefore to conſider theſe ob-

jects, they would be like pearl thrown before ſwine. I beſeech you then, who aſk me with a ſneer to what end this or that ſtone, plant or animal ſerves, i beſeech you to awake, and open your eyes while you live in this world. All theſe things are not the work of man, but of wiſdom itſelf, which created both thee and me. He has ſettled an œconomy in this globe, that is truly admirable by means of an infinite number of bodies, and all neceſſary, which bear ſome reſemblance to one another; ſo that they are linked together like a chain. For as in our œconomy neither the plough, nor the hedges, nor the dunghill are fit for food, or phyſic, yet are abſolutely neceſſary; ſo in the œconomy of nature there are many things that are as neceſſary, but not immediately. Men reckon their œconomy amongſt the chief of human inventions, conſider then the ſublimity of the divine œconomy. You ſee therefore that it muſt at laſt be granted me according to the opinion of divines and philoſophers, that every thing was created for the uſe of man, and man for the glory of the Creator. Can you then believe, that any thing can be uſeleſs that ſerves not for food, or phyſic? The Creator has ſo framed

the

the world, that man ſhould every where behold the miraculous work of his hands, and that the earth ſhould afford an endleſs variety, ſeemingly with intent that the novelty of the objects ſhould excite his curioſity, and hinder him from being diſguſted by too much uniformity, as it has happened to ſome wretches, whoſe ſtation in life placed them above labor, and who wanted curioſity to look into theſe things. Some objects were made to pleaſe the ſmell, the taſte, the ſight, the hearing, or other ſenſes, ſo that nothing can be ſaid to be without its uſe. That branch of knowledge which ſerves to diſcover the characters of natural things, and teaches us to call them by their names, ſeems perhaps by no means neceſſary. But let it be conſidered that the firſt degree of wiſdom is to know things when we ſee them, i. e. to know them by their names; and without this knowledge ſcarce any progreſs can be made. To know the letters of the alphabet, to joyn them into ſyllables, to underſtand words is not ſolid erudition; yet it is abſolutely neceſſary for him who would become learned. Thus the characters and names of things muſt be thoroughly learned in order to obtain any uſe from natural hiſtory. We find in the journals of travellers,

many things mentioned, partly curious, partly uſefull, concerning animals, plants, and ſtones; but thoſe obſervations can be of no uſe to us, till we are able to refer each to its genus; that we may make them a part of the ſyſtem, and know that this curioſity, or uſe belongs to this or that object, when it happens to come in our way.

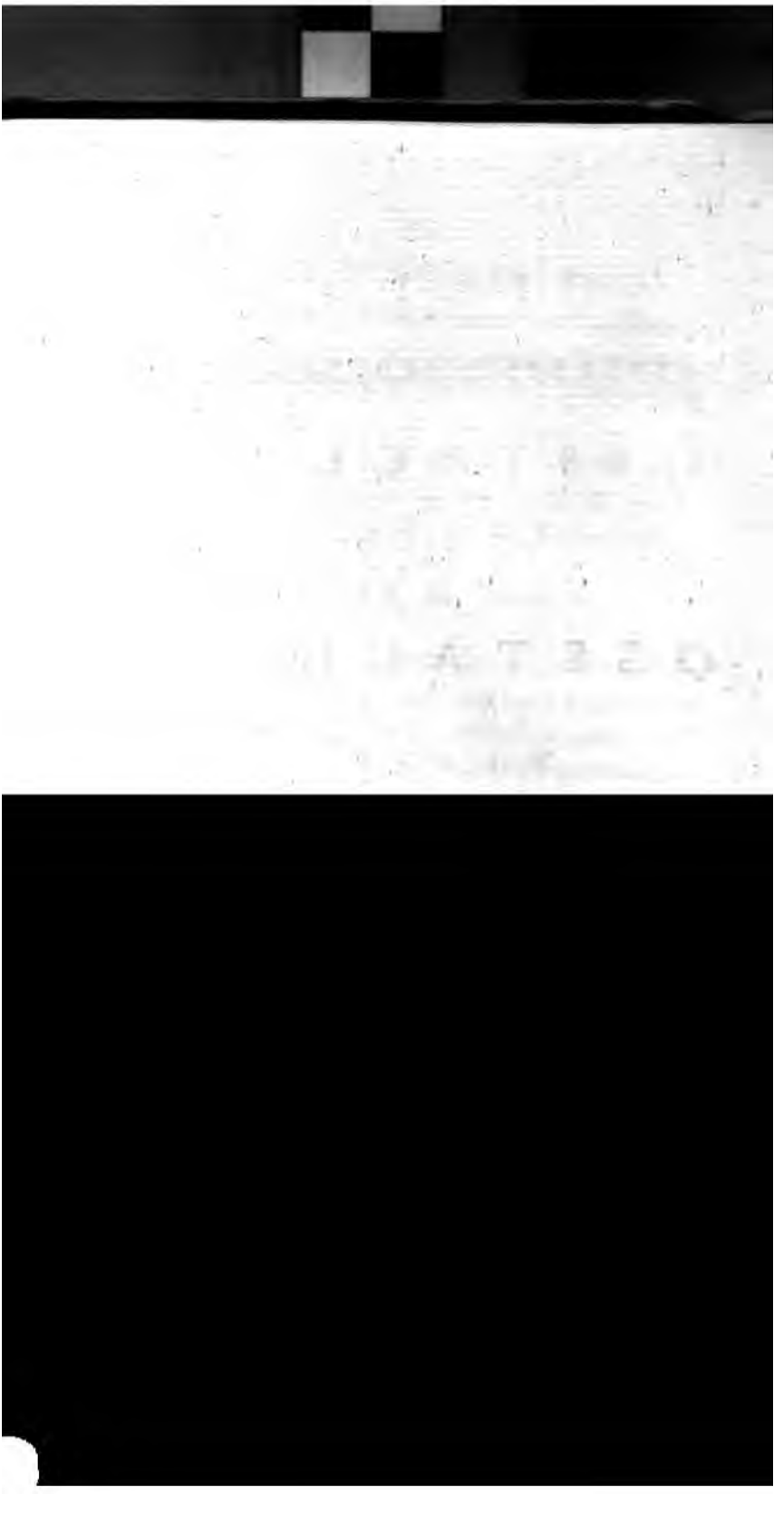
§. 15.

If man was created to give praiſe to his Creator; if the Creator has made himſelf known to man by creation, and revelation; if all created things are formed with wonderfull mechaniſm; laſtly, if all things were created for the uſe of man, and nothing but natural things, and the elements can be of uſe to him; then it may be inquired with the ſame reaſon, to what end any other thing was created, as well as man; the ſupreme Being having created nothing but for a certain end, and for ſome valuable purpoſe. We are often ignorant what that purpoſe is, but it would therefore be impious to ſay that any thing was created in vain, ſince he declared that *every thing which he had created was good.* Gen. i. 31.

OBSTACLES

TO THE

Improvement of PHYSIC.



OBSTACLES TO THE IMPROVEMENT of PHYSIC.

BY

JOH. GEORG. BEYERSTEIN.

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PREFACE.

ALthough phyſic in its whole extent has received great improvements in this age, as moſt of its parts have been diligently looked into and reformed; yet its chief ſtrength ſeems to conſiſt in accurate knowledge of diſeaſes, and medicines, and when we turn our eyes on the preſent times, we find that many ſimple medicines have been neglected; which ſo little deſerve it, that they rather ought to be revived,

vived, and brought into practice. Which being the caſe, i have frequently endeavored to find out the cauſe of this common ignorance. The reſult of my inquiries i ſubmit to the judgment of the candid reader in this academical exerciſe, which, though far from compleat, is the beſt i could produce, and i hope it may prove of ſome uſe, and meet with a favorable reception.

Various cauſes have concurred to bring many medicines into neglect.

1.

Faſhion which prevails in phyſic, as it does in

on the other hand the *bear-berry* has been neglected, though an efficacious aſtringent. The *graſs of Parnaſſus*, and *ſun-dew*, have crept into the ſhop by chance. The *carline thiſtle*, an excellent remedy in hyſteric complaints, is neglected. Thoſe poor wretched plants the *vervains* increaſe the number of officinals without any merit of their own, and only ſupported by the teſtimony of antiquity.

2.

The many theories and hypotheſes of phyſicians that vary in every age. For men have been vain enough to imagine that they knew the immediate cauſes of diſeaſes, the manner in which medicines operate, and from their principles have undertaken to deduce the vertues of medicines.

Formerly *hot* and *volatile* medicines were uſed in acute diſtempers. At preſent the *acid*, *cooling*, and *diluting* with *bleeding* are recommended. *Muſk*, *ambergris*, *civet* were looked upon as moſt efficacious in *eruptive fevers*, now juſt the contrary. And thus *meadow-ſweet*, *woodruff*, *muſk crane's bill*, may in their turn come into credit, which now are ſeldom uſed for driv-

driving out theſe eruptions; though we may be aſſured of their vertues by undoubted experiments long ſince made.

3.

The neglect of ſpecifying diſtempers. Hence remedies, which are excellent for ſome diſeaſes in one man; nay even thoſe very remedies that get the name of ſpecifics on account of ſome very remarkable vertue, when adminiſtered to another, are either of no ſervice, or even do miſchief; whereas they would perhaps never fail of a good effect, if the ſpecies of the diſtemper were the ſame. Therefore till phyſicians regulate the doctrine of diſeaſes in the

diſſ. med. dni. Arch. Bæck. de medicam. domeſt.

4.

An haſty and imprudent judgment about poiſons, and their difference from medicines which in reality differ only in degrees of ſtrength. Hence our anceſtors ſcarcely ever dared to preſcribe the uſe of plants, which they imagined to be poiſonous.

The *laurel* is neither uſed in conſumptions, nor venereal complaints, though an excellent remedy; becauſe it is ſuſpected to be poiſonous. The *paſque flower*, whoſe root is very efficacious in hyſteric complaints, is gone out of vogue; becauſe Helvigius knew a perſon who dyed upon uſing a ſyrup made of it; as if all inebriating drinks were to be diſcarded, becauſe ſome have loſt their ſenſes, and lives by an inordinate uſe of them. The *lignum colubrinum*[c], that is famous in venomous bites, and the quartan ague, is neglected for the ſame reaſon. Scarce any one dares

[c] In vol. 2. Amæn. academ. there is a treatiſe on the *lignum colubrinum*, in which the author undertakes to determine from what plant this root is taken, and obſerves that druggiſts, for want of a proper deſcription, have confounded it with two other plants, one of which, and that generally in the ſhops, is of a poiſonous nature.

recom-

recommend the uſe of the *mandragora*, although Schopperus has ſhewn its vertues in the gout. The *deadly night-ſhade* is not yet brought into practice, though we have great reaſon to expect much from it in diſperſing tumours of the breaſt [f].

5.

The abuſes of quacks, and their bold, and dan-

[f] I cannot omit ſaying a word or two on the ſubject of the *deadly night-ſhade* on this occaſion, as the trial of it cauſed ſo much noiſe in this town ſome time ago. I know the generality of people look on its fate as decided; and that it is deſtined never to revive again; but that is not clear to me. Some of the faculty ſtill entertain a good opinion of

gerous experiments. Theſe have made many patients averſe to ſome of the moſt celebrated medicines, inſomuch that a phyſician dares not preſcribe them. For ſome timid injudicious friend is always at hand to impoſe upon their weakneſs, and let them know, that they are going to take a remedy, which had proved fatal to others; not conſidering that it was owing to the wrong application, and not to the nature of the remedy.

The *hellebore* formerly cured many deplorable diſtempers, but by the errors of quacks, and their immoderate doſes, it has ſo happened, that it is fallen into diſuſe; but the *wild cucumber* and *bitter apple* are beginning to revive again. The bark of the *berry-bearing alder* is a very excellent purge, yet phyſicians have been almoſt afraid to preſcribe it, perhaps terrifyed by the ill ſucceſs of thoſe daring men above-mentioned, who gave too large doſes of it. Many of the moderns for a long while dared not make uſe of opium even externally.

6.

The timidity, and caution of phyſicians leſt they ſhould hurt their patients by violent remedies.

For which reaſon they give rather mild, than efficacious ones, and act the part of ſpectators, rather than phyſicians.

For this reaſon perhaps the diſciples of Stahl reject the *bark*; though from ignorance of botany they uſe the *caſcarilla*, which is certainly a very good medicine in ſhiverings, but not totally void of malignity. Phyſicians did not for a long while preſume to preſcribe the *wild cucumber*; which is indeed pretty violent, but by no means ſo terrible, that it ought not to be uſed even in the dropſy. For the ſame reaſon they did not venture to uſe the *ſquill*, whoſe vertue is very great in thining viſcidities; viz. becauſe they did not know the proper doſe of either of them. The *gamboge* is neglected, though the Turks have taught us its efficacy in a quartan; and the experiments of our preſident in the hoſpital at Stockholm have confirmed their practice.

7.

Small doſes of phyſic. For while phyſicians have been over-cautious in their preſcriptions, they have fallen into the inconvenience of doing the patient no ſervice; and to confeſs

the truth, i ſuſpect they more generally err this way at preſent; while they order drachms of plants for an infuſion, where ounces would be more proper. On the other hand mountebanks, and quacks, men of an intrepid mind, and invincible impudence, oftentimes make a cure, when the phyſician of probity fails.

If any one were to preſcribe only two grains of *rhubarb* for a purge, he might as well do nothing at all. The *honey-ſuckle* is uſed in decoctions, but not in the quantity neceſſary; for which reaſon its vertue in purifying the blood is known but to few. The doſe of the *china root* ought to be large, or no good can be expected from it in venereal caſes. Thoſe remedies which are ſought for amongſt vegetables for curing the venereal diſeaſe are perhaps given more ſparingly, than they ought.

8.

The ignorance of apothecaries in botany, who often ſell one plant for another; by which means, when the deſired effect is not obtained, the phyſician is deterred from the uſe of them for the future.

For *rad. hermodact.*, which is recommended

in the rheumatiſm, the apothecary ſometimes gives the root of the *meadow ſaffron*; ſometimes of one of the *iriſes*, which differ from it in vertue. Hence the effect of the phyſician's preſcription being uncertain, he is at laſt obliged to give it up entirely. For the *ſcabious* they give the *centaury*, Fl. Suec. 708. For the *brankurſine*, the *cow-parſnep*, 231; the root of the *toothwort*, which is excellent in the tooth-ach, is neglected, becauſe the apothecary does not know, whether it ought to be taken from the *toothwort* 565, or 518, or ſome other plant. Inſtead of the root of the *burnet ſaxifrage*, which is a good aſtringent in the hæmorrhage, the root of the *burnet* is wrongly ſubſtituted. To this may be referred the miſtake of ſelling the *St. John's wort* 624 for the *St. John's wort* 625, which is vulnerary and good in worm caſes.

9.

The ignorance of phyſicians in botany, or their want of care to reject uſeleſs, ſpurious and improper ſuccedaneums.

We ſuſpect that this formerly was the caſe; but now that the knowledge of botany is carried

carried ſo far, we have reaſon to hope, that things will go better. The *acmella* which is very ſerviceable in the ſtone, ſince it is extremely rare, and dear, is to be ſupplyed out of thoſe plants which are really akin to it. This choice belongs to the botaniſt: for which reaſon our preſident has obliged the world by informing it, that the *ſieges beckia*, as neareſt allyed to the *acmella*, may be rightly ſubſtituted in its room [s]; which Dr. Haſſelquiſt has confirmed by an experiment made here at Upſal upon a young man afflicted with the ſtone. The ſkilfull in botany will eaſily judge that the *German leopard's bane*, as well as the *common*, carries ſuſpicion of poiſon; yet the former has been looked on as harmleſs by thoſe, who were ignorant of botany, and the latter dangerous. The *daiſy* is cried up in vain on account of the excellent vertue it is ſuppoſed to poſſeſs. Practitioners, unleſs they be ſkilfull in botany, will ſcarcely allow the *wild roſemary*

[s] Vid. Amænit. Academ. vol. 2. p. 151. where ſome ſuccedaneums to the Senega root are mentioned, founded on the ſame principles.

to be a moſt efficacious remedy againſt the hooping cough; which yet is commonly uſed in this diſeaſe by the Weſtrogoths. The *Turkey baum* is kept in our ſhops, altho' much weaker than the *Canarian*, which is excluded. The *white ſaxifrage* and *dropwort*, tho' neither of them has any extraordinary quality, yet hold a place amongſt our officinals. The *mechoacana* is ſeldom uſed, as being of no great ſtrength, yet it is a very proper purge for infants. The *oak of Jeruſalem* is gathered from the *European* plant, whereas both taſte and ſmell inſtruct us, that we ought to get it from the *American*, as a moſt powerful remedy in conſumptions. The plant and ſtalk of *black currants*, no contemptible medicine in the *hydrophobia*, in *feveriſh dyſenteries*, and other contagious diſtempers, are now neglected, as the antients have ſaid nothing about their vertues; which yet are diſcoverable by the ſmell, tho' not by the taſte.

10.

The uſe of compound medicines. Simples are ſo

ſo very rarely uſed, that the vertues of plants are not known for want of experience.

It is ſcarcely neceſſary to produce inſtances of this aſſertion. Whoever turns over the writings of the antients will be aſtoniſhed at the preſcriptions, or rather indexes, in which numberleſs things are mingled together. This affair ought to be looked into, and regulated; that we might not fall under the laſh of ſome future Serenus Sammonicus, who might addreſs himſelf thus to ſome phyſicians:

Ye jumble in one maſs ſuch coſtly juices,
So various in their natures, in their uſes;
That the poor patient, who relies upon you,
At once is cheated of his health, and money.

II.

The mixing things together of a different nature. For oftentimes many things are confounded together, which ſeparately adminiſtered might aſſiſt the patient, and give credit to the phyſician; whereas mixed they become uſeleſs, one deſtroying the effect of the other.

Thus *watery* mixed with *dry*, *viſcous* with *ſaline*, *glutinous* with *ſtiptical*, *ſweet* with

acrid, *acid* with *bitter*, *ſapid* with *nauſeous*, mutually weaken each other [h].

12.

The ignorance of the natural claſſes. From hence it happens that we cannot form any judgment, conformable to botanic principles, of one plant from the knowledge of another. And thus we are afraid of propoſing any uncommon plant, being doubtful what we ought to expect from it.

Dogs mercury has been given internally, for want of knowing the natural claſſes;

ranked amongſt the *emollients*, although not one among all the *umbelliferous kind* that i know of, is famous for this quality. The people of America ought to give the *mitreola*, Hort. Cliff. for the bite of ſerpents inſtead of the *ophiorrhiza*; which if they were to do, they would hardly ever fail of ſucceſs, if botaniſts be not greatly miſtaken.

13.

The neglect of vulgar medicines eaſily to be procured. For we owe the very beſt of our medicines to the vulgar, who have been taught the uſe of them by neceſſity, and conceal them as ſecrets.

We learned the uſe of the *mezereon* in the cancer from the countrey people. The *noble liverwort* is reckoned a ſpecific in hypochondriac affections by the Gothlanders. The *linnæa* is commonly uſed by the Oſtrobothnians in gouty pains. The common people uſe *pepper* oftentimes very injudiciouſly in acute diſtempers; in eruptive fevers under certain circumſtances very rightly. The countrey people taught us the virtues of the *thruſh-moſs* for ſore throats; of the *hop*

in

in diſlocations; and of the *tremella*, Flor. Suec. 1017. for fixed pains in the joynts. They alſo chew, and blow the fumes of *garlic* into infants to aſſuage their gripes; or bruiſe, and apply it to the navel by way of poultice [1].

14.

The neglect of travelling out of Europe. Which would afford us an opportunity of knowing plants, familiar to forreign nations. And I ſee not why we ſhould be aſhamed of learning any thing uſeful from Barbarians.

It is not long ago that ſome botaniſts, who went to America, diſcovered to us thoſe excellent medicines, the *great water-dock* in the worſt ſcorbutic caſes; the *monarda* in intermittents; the *collinſonia* in the colics of lying-in women; the *lobelia*, the *ceanothus*, the *diervilla*, in venereal caſes; the *ſenega root* and *ophiorrhiza* againſt the bite of ſerpents and burning fevers. The celebrated Kalm very lately let us know,

[1] Ulloa obſerves that ſome diſeaſes at Carthagena are become fatal, which formerly were not ſo. Which he attributes to the neglect of the Indian remedies. For he ſays the old women even now ſometimes cure the *chapetonade*, which is one of the diſtempers he mentions, and formerly never failed to cure it.

that

that the *water avens* is looked on as a ſuccedaneum to the *bark* by the people of Canada. The *water fig-wort* that corrects *ſenna*; the *bark*, &c. were communicated by the Barbarians.

15.

The neglect of reading botanical writers, eſpecially thoſe, who in theſe latter times have faithfully ſet forth what they knew, by certain experiments concerning the vertues of plants.

Of this kind are Rheede, Sloane, Feuilleè, &c. The uſe of the *coris* is unknown to moſt people, who have not ſeen what Shaw ſays on that ſubject. The vertues of the ſtalks of the *bitter-ſweet* purifying the blood were a ſecret, till our preſident brought them to light. Before him the apothecaries gave only the *garden night ſhade*, or the leaves of the *bitter-ſweet*, yet few here have found any good effect from them; as we have rarely given this remedy hitherto in ſufficient doſes. The *reſt-harrow* is ſeldom preſcribed, becauſe phyſicians have not learned its vertues in the Hungarian fever from Scyller. The antients recommended the *cot-*

ton-

ton-thiſtle in cancerous caſes; but from neglect of reading the ancients, this ſpecific is almoſt forgot.

16.

Neglect of a method in exhibiting medicines. For inſtance, phyſicians expect thoſe vertues from a dryed plant, or in a decoction, which are not to be found but in the freſh plant, or from its expreſſed juice. Hence it may juſtly be expected from apothecaries, that they ſet about cultivating plants; that ſuch, as ought to be uſed freſh, may be had daily from their gardens.

and *Indian creſs*, and the *all-ſawce*, ought to be ſold in the ſhops freſh, and not dryed; in order to be of any ſervice in the ſcurvy. The *recent* root of the *roſe-wort* is vaſtly ſuperior to the *dry* in head-achs. Beſides it ought carefully to be conſidered in what part of a plant its vertue reſides. Thus it is the *juice* of the *poppy*, that ſpreads over the brain, as it were, a Lethean drowſineſs; and not the *ſeeds*, for theſe are eatable. The ſagacity of the moderns has reduced the immenſe number of diſtilled waters to a very ſmall liſt.

17.

Neglect in cultivating plants. Hence apothecaries are neceſſitated to ſell plants, which they have had by them many years, and which have loſt all their vertues.

The *ſpikenard* is more durable, perhaps than any other plant; for it will keep its fragrance above an age, as appears by Burſerus's Herbary. But other plants are very different in this reſpect. e. g. the root of *ginſeng*, tho' a great reſtorative, being ſo very coſtly, is ſeldom preſcribed; and when it is, it generally has loſt its properties thro' age. For which reaſon we ought to con-

contrive methods of cultivating it ourſelves. Inſtead of the leaves of the true *marum*, which has not its equal in art, or nature, the mouldy ſtalks of it are generally found in apothecaries ſhops. But we would not be underſtood as if in all caſes we prefer the cultivated plants to the wild ones. On the contrary the *vipers graſs*, the *goats beard*, the *ſuccory* from the fields are ſuperior to thoſe which the induſtry of the gardener has rendered more delicate; on account of the medicinal bitter, which is wanting in their cultivated ſtate. See a catalogue of ſuch plants as may be raiſed with us, in Linn. Mat. Med. p. 212.

18.

The ignorance of phyſicians and apothecaries in relation to our own plants. From whence it happens that they are obliged to procure plants from abroad which may be had at home.

Thus our people buy the root of the *roſewort* and root and ſeeds of the *garden angelica* collected by the Norwegians on our alps, and ſold by them to forreigners. For the reſt ſee a catalogue of ſuch plants, as are natives of our countrey, in Mat. Med. above cited, p. 210. If a purge or any other

other ſlight medicine is preſcribed to a poor countrey fellow, it muſt be the produce of the Indies, ſo that they cannot afford to purchaſe it. Hence people abhor the thoughts of employing a phyſician or an apothecary.

19.

The ignorance of many foreign plants. Hence we are uncertain whether thoſe which are brought to us be genuine or ſpurious; and hence alſo their genera being unknown, we are uncertain about their vertues.

To this head may be referred the *ſea lavender*, the *myrobalan*, the *ſtarry anniſeed*, the *balſam* of *Copaiva*, the *balſam* of *Peru*, the *gum animæ*, *caraunæ*, *elemi*, the *gum roſins* of *myrrh*, *bdellium*, *ſagapenum*, the *aloes wood*, *calambac* [k].

20.

The uſual cuſtom in apothecaries ſhops, of providing only drugs of quick ſale. Thus they will not procure ſome whoſe vertues are now-a-days well known, for fear they ſhould lye up-

[k] Hence appears one of the advantages amongſt many others that may ariſe from the voyages of the diſciples of Linnæus into the remoteſt parts of America and Aſia, from whence many of our drugs come.

on

on their hands. It is the buſineſs therefore of the phyſician, who has any regard for his own reputation, and the patient's welfare, to require the apothecary to procure ſuch plants, as he thinks may be uſefull.

Simorouba an excellent remedy in the dyſentery, the *ſenega root* in venomous bites, the *profluvii cortex* in the diarrhæa, the *camphorata* in the green ſickneſs, the *auricularia* in deafneſs, the *Peragua* in the diabetes, the *ſouth-ſea tea* in the ſmall-pox, the *ſerpentum radix* againſt venomous bites, the *wild flax*, a very uſefull purge, are neglected. The juice of the *hypociſtis*, and *fungus melitenſis*, altho' powerful me-

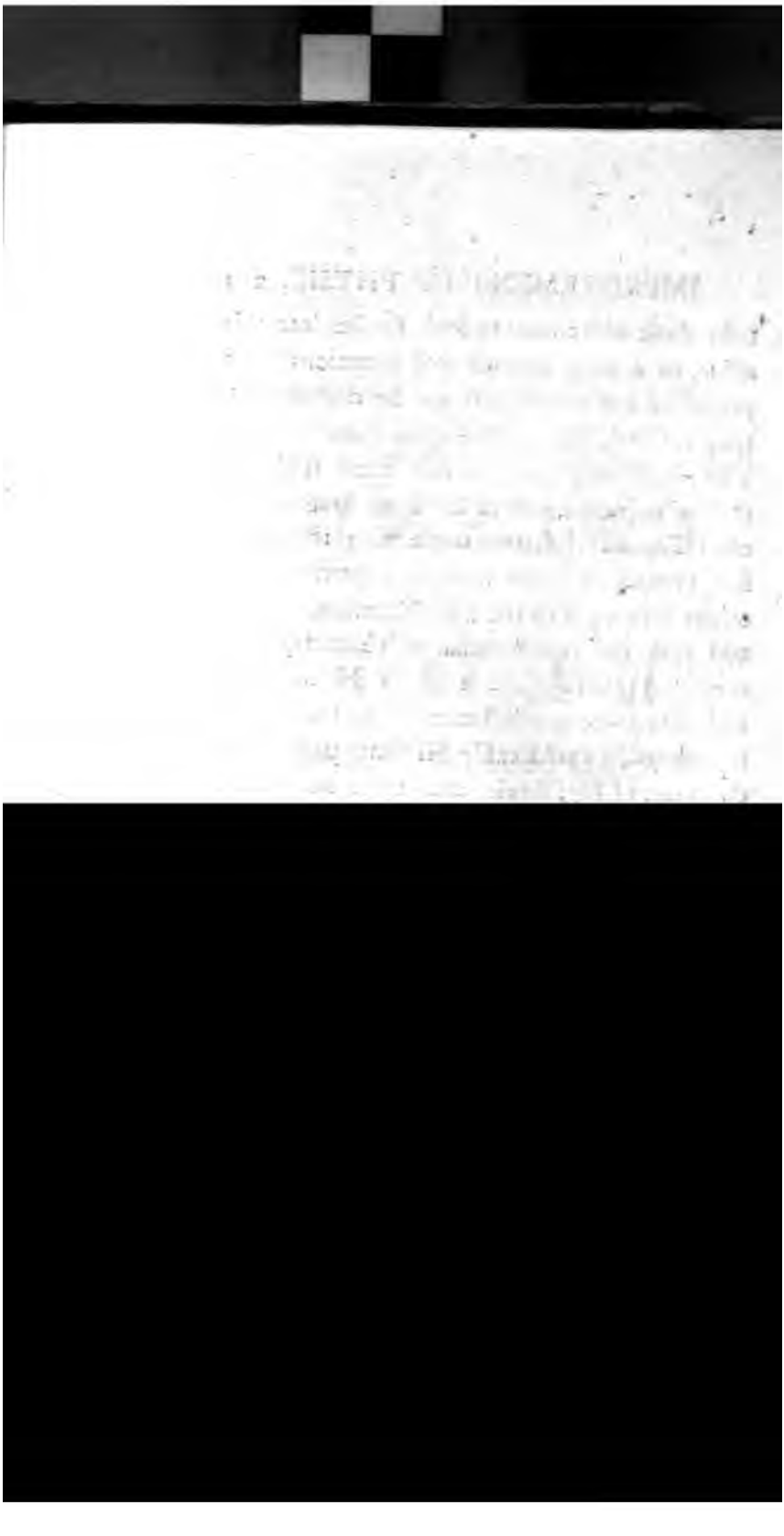
The root of the *avens*, unleſs gathered in the beginning of the ſpring, before the ſap by nouriſhing, and puſhing out the leaves has waſted its aromatic vertue, will by no means anſwer what may be juſtly expected from it. *Rhubarb* ought not to be brought into an apothecary's ſhop under ten years from the time of its gathering. The flowers of the St. *John's wort* ought to be gathered before they are full blown, that their balſamic virtue may be preſerved. The root of the *angelica* is good for nothing unleſs it be gathered in the winter. *Sloes* ought to be gathered before they are ripe, and the juice preſſed out of them in this ſtate, i. e. before the harſhneſs is ſoftened by the froſt, if it be deſigned for an aſtringent. *Marum* ought to be kept in veſſels well cloſed, leſt the volatile part, in which its vertue reſides, ſhould evaporate.

——Still an ample field remains,
But not for me, to others i give way,
Who chooſe a longer courſe.

AS i do not pretend to underſtand the ſubject of this piece, and therefore cannot ſay how far the obſtacles to the advancement of phyſic charged upon the Swedes ſubſiſt in this countrey, or whether all thoſe obſtacles, which the author has mentioned, be real or not, my ſole motive for tranſlating it was to draw it out of that obſcurity in which it was buried amongſt many other pieces, relating to curioſities of natural hiſtory. I think i may be allowed to ſay a piece is buried in obſcurity, which is only known to a few, who happen to be in the way where ſuch curioſities are talked of; and an attempt to ſpread it over the nation cannot but be right, if the doctrine be ſolid, and affects our practitioners.

Tho' as i ſaid i do not pretend to underſtand the ſubject of this piece; yet i hope the learned reader will excuſe me, if I add one obſtacle more to the foregoing liſt; it is *the notion which has and i believe ſtill does prevail amongſt ſome phyſicians, that the doctrine of ſpecifics is groundleſs, and took its riſe merely from ignorance in natural philoſophy.* I will not undertake to treat this ſubject as the importance of it deſerves; and therefore ſhall refer

refer thoſe who chooſe to look farther into this affair, to a very curious and ingenious book publiſhed not many years ago by doctor Martyn, entitled, *Eſſaies Philoſophical and Medical.* The reader may perhaps find there ſufficient reaſons to incline him to lay ſome ſtreſs on the old-faſhioned doctrine concerning the peculiar vertues of ſome medicines preferably to others ſeemingly of the ſame intention. I will add that the phænomena of chemiſtry give continual proofs of the reality of this doctrine, and afford ſo many inſtances of it, that were i ſo inclined, i could eaſily fill ſome pages with them out of Mr. Boyle, and other authors of credit. Ray in his hiſtory of plants, p. 49. cites ſome very curious obſervations of this tendency from Grew, which are well worth the conſideration of phyſicians. Upon the whole i cannot help thinking that the want of true and genuine philoſophy ought rather to be imputed to thoſe who deny, than to thoſe who maintain the doctrine of ſpecifics; and that we might as well undertake to open all locks with one key, as purge all humors with one medicine.



THE

CALENDAR

OF

FLORA,

SWEDISH and ENGLISH.

Made in the YEAR 1755.

Φραζεδ δ' ευτ' αν φωνην γερανου επακουσης, &c.
Ημος κοκκυξ κοκκυζει, &c.
Ημος δε σκολυμος τ' ανθει και ηχετα τεττιξ, &c.
Ημος δη το πρωτον, οσον τ' επιβησα κορωνη.

Heſiod.

ABSOLVENT POSTERI.

THE

CALENDAR

OF

FLORA,

SWEDISH and ENGLISH

For the Year 1757.

TO THE

RIGHT HONOURABLE

THE

Lord Viſcount BARRINGTON,

SECRETARY AT WAR.

My Lord,

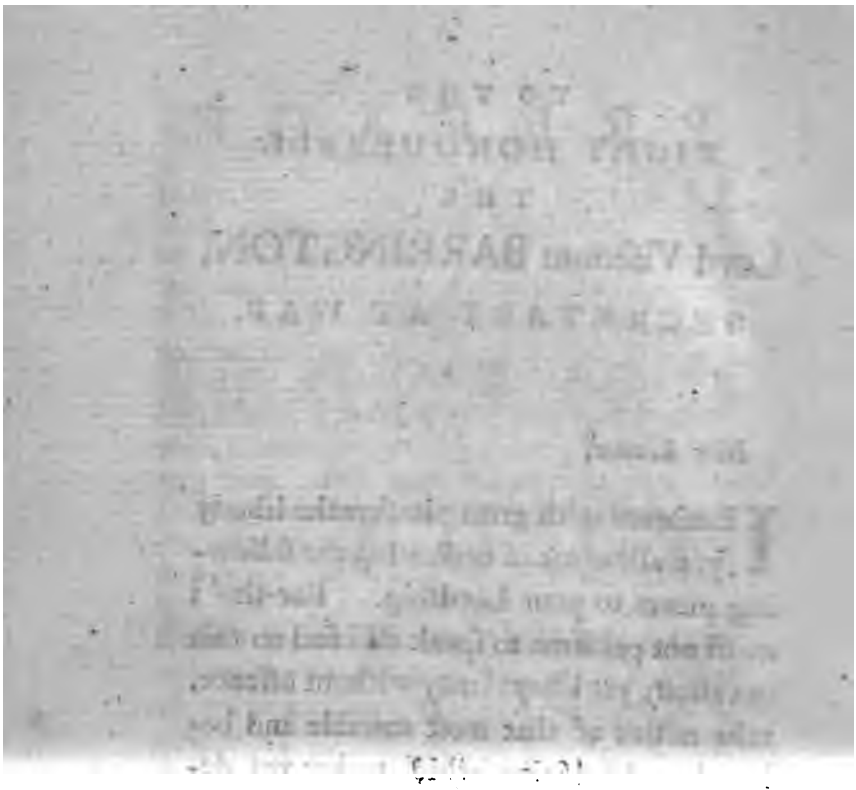
I Embrace with great pleaſure the liberty you allow me of dedicating the following pieces to your Lordſhip. For tho' i muſt not preſume to ſpeak all i feel on this occaſion; yet i hope i may without offence, take notice of that moſt amiable and benevolent diſpoſition, which makes you delight in aſſiſting thoſe, who are incapable of making any return. This is the leaſt that can be ſaid by one, who is himſelf of that number, and who is deſirous to expreſs in a public manner his ſincere gratitude and reſpect. I am,

MY LORD,

YOUR LORDSHIP's MUCH OBLIGED

AND VERY HUMBLE SERVANT,

BENJ. STILLINGFLEET.



PREFACE.

IN my notes on thoſe treatiſes ſelected out of the Amænitates Academicæ, which i publiſhed not long ago, i marked the day of the month on which certain trees leafed in the year 1755; and likewiſe mentioned ſome coincidences of the coming of birds, and the flowering of plants in this and other countries. The inſtances i there gave were but few, as i could then find no more parallel obſervations made in other countries to compare mine with. Since that time another volume of the Amæn. Academ. is come out, in which is a ſmall treatiſe entitled, the Calendar of Flora. This treatiſe contains an account of the leafing, flowering, &c. of a great number of plants, as alſo of the departure and return of birds. As theſe obſervations happen to be made the very ſame year in which mine were, and as they are the firſt of the kind perhaps that ever were made, i was induced to look over my papers again, which i had thrown by as of no conſequence; thinking that in theſe circumſtances ſome uſe ought to be made of them, as they might prove entertaining at leaſt, if not inſtructive to thoſe whoſe genius leads them to curioſities of this kind. I am very ſenſible how ſmall the number of ſuch perſons is, but i am contented to write for thoſe few, nay, indeed i write becauſe there are ſo few, being willing as far as lies in my power to increaſe their number.

But it may be aſked perhaps by ſome, even after they have conſidered all that is ſaid on this ſubject in the introduction to the following Swediſh Calendar, and in the piece De Vernatione

Arborum, why endeavor to increaſe their number? Are there not idle people enough already? What ſignifies whether ſuch a plant be in blow or in leaf at the ſame time with ſome others; or when ſuch a bird comes or goes, ſings or is ſilent? If we hear the bird ſing, and know for what purpoſes the plant is uſeful, we know all that is neceſſary; every thing beyond that is but the wiſh, or rather dream of enthuſiaſm, which wants to give an air of importance to its favorite ſubject. This perhaps may be ſaid by ſome; but the ſame way of reaſoning applied to other things will ſhew, that it may poſſibly be wrong. For inſtance, the ſea ſwells twice in 24 hours, and the moon paſſes thro' the meridian circle as often in the ſame time. Now ſhould it be ſaid, that if we know each of theſe truths ſeparately it is enough; and that to know farther what relation in point of time one of theſe phænomena has to the other, is nothing to the purpoſe; i believe ſuch an aſſertion would at this time appear abſurd, however it might have paſſed in ignorant ages. I think we may aſſert univerſally, that whenever two things, however diſparate in their nature, conſtantly accompany one another, they are both actuated and influenced by the ſame cauſe. Now that cauſe may probably operate on other things that lye within the reach of our powers, and depend on our determination. Thus that conſtitution of the air, which cauſes the cuckow to appear about the time, when the fig-tree puts forth its fruit, may indicate the propereſt ſeaſon to ſow ſome of our moſt uſeful ſeeds, or do ſome other work which it imports us to do at a right time; and that time may not be according

cording to certain calendar days, but according to a hitherto unobſerved calendar, which varies ſeveral weeks in different years. I do not abſolutely aſſert, that we can come to make uſe of ſuch a calendar, but i deſire that others will not aſſert the contrary at preſent, but leave this affair to be decided by the only proper way, which certainly muſt be experience.

We know from Heſiod, that huſbandry was in part regulated by the blowing of plants, and the coming or going of birds; and moſt probably it had been in uſe long before his time, as aſtronomy was then in its infancy *; but when artificial calendars came into vogue the natural calendar ſeems to have been totally neglected, for i find no traces of it after his time, whether for good and ſufficient reaſons i pretend not to determine. That it was laid aſide before the time of Ariſtophanes we have a poſitive proof in his *Aves*, where he makes Piſthetairus ſay, 'Formerly the kite 'governed the Grecians, which according to the 'explication of the ſcholiaſt means, that formerly 'the appearance of the kite was looked on as a ſign 'of ſpring. He ſays afterwards, that the cuckow 'formerly governed all Ægypt and Phœnicia, 'becauſe when that bird appeared they judged it 'was time for wheat and barley harveſt.'

I ſhall make no farther mention at preſent of the uſe of plants in directing the huſbandman, but take this opportunity of making a digreſſion

* Heſiod himſelf was one of the earlieſt of the Greek aſtronomers. He lived, according to Sir Iſaac Newton, about 70 years after Chiron, who formed the conſtellations for the uſe of the Argonauts; and from Heſiod the groſs and coarſe method of aſtronomy was called the Heſiodean method.

was made in the ſpeculations of men, which appears in the poet's words, and that they were eaſily induced to think, that the ſurpriſing foreſight of birds, as to the time of migration, indicated ſomething of a divine nature in them; which opinion Virgil, as an Epicurean, thinks fit to enter his proteſt againſt; when he ſays,

Haud equidem credo quia ſit divinitus illis
Ingenium.

But to return to Ariſtophanes. The firſt part of the chorus from whence the afore-cited paſſage is taken, ſeems with all its wildneſs to contain the fabulous cant, which the augurs made uſe of in order to account for their impudent impoſitions on mankind. It ſets out with a coſmogony, and ſays, that in the beginning were Chaos, and Night, and Erebus, and Tartarus. That there was neither water, nor air, nor ſky; that Night laid an egg, from whence, after a time, Love aroſe. That Love, in conjunction with Erebus, produced the bird kind, and that they were the firſt of the immortal race, &c.

With this paſſage in Ariſtophanes, the account of the oracle of Dodona ſeems to agree. This oracle was the oldeſt in Greece, and there a *dove* propheſied, according to the concurrent teſtimony of hiſtory; but according to the explication of Herodotus this ſtrange opinion aroſe from hence, that the Theban prieſteſs, who was ſtolen by the Phœnicians, and carried into Greece, was called a *dove*, becauſe being a barbarian, ſhe ſeemed to the Dodoneans to chatter like a bird, till ſhe had learned the Greek language, and then ſhe was ſaid to ſpeak with a human voice. This explication

as ſoon as ſome impoſtor was impudent enough to aſſert it. Add to this, that the diſpoſition in ſome birds to imitate the human voice muſt contribute much to the confirmation of ſuch a doctrine. This inſtitution of augury ſeems to have been much more ancient than that of aruſpicy; for we find many inſtances of the former in Homer, but not a ſingle one of the latter that i know of; though frequent mention is made of ſacrifices in that author. From the whole of what i have obſerved, i ſhould be apt to think that natural augury gave riſe to religious augury, and this to aruſpicy, as the mind of man makes a very eaſy tranſition from a little truth to a great deal of error.

A paſſage in Ariſtophanes gave me the hint for what i have been ſaying. In the comedy of the *Birds* he makes one of them ſay thus: 'The 'greateſt bleſſings which can happen to you 'mortals are derived from us; firſt we ſhew you 'the ſeaſons, viz. ſpring, winter, autumn. The '*crane* points out the time for ſowing, when ſhe 'flies with her warning notes into Ægypt; ſhe 'bids the ſailor hang up his rudder and take his 'reſt, and every prudent man provide himſelf 'with winter garments. Next the *kite* appear-'ing proclaims another ſeaſon, viz. when it is 'time to ſhear your ſheep. After that the *ſwal-'low* informs you when it is time to put on ſum-'mer cloaths. We are to you, adds the chorus, 'Ammon, Dodona, Apollo; for after conſult-'ing us you undertake everything; merchandize, 'purchaſes, marriages, &c. Are we not then to 'you on the footing of Apollo, &c.' Now it ſeems not improbable, that the ſame tranſition was

the *turtle*, the *blackbird*, and the *lark*, as certainly hiding themſelves; which ſhews how little was known of their real ſtate in his days; nay, ſo much was he puzzled about this ſubject, that in another place he ſuppoſes ſome of the birds to be changed in their form and voice at different ſeaſons. Thus he ſays, that the *redſtart* changes into the *robin redbreaſt*; and Geſner gives this reaſon for Ariſtotle's falling into this opinion, that during the ſummer the *robin redbreaſt* lives in deſert places, and comes towards towns and houſes in the autumn, when the *redſtart* diſappears. Again Ariſtotle ſays, that the *black cap* changes into a *beccafigo*, which laſt appears, as Geſner obſerves, about autumn, when the figs are ripe, and the former after the autumn. It is true Ariſtotle mentions ſome kinds of birds which go to warmer climates when they diſappear, which is a proof that their migrations were not wholly unknown in thoſe days; and indeed the poems of Homer prove that they were in part known much earlier. Nor could it happen otherwiſe, when the inquiſitive genius of Greece began to work, and carry men into Phœnicia and Ægypt, with a view of improving themſelves in all parts of learning; where they could not avoid obſerving, that ſome birds which left Greece in the winter were found at that time in thoſe warmer climates. But the ſuperſtition was already confirmed before this happened. Dodona was eſtabliſhed on a foundation not to be ſhaken by the weak attempt of reaſon and experience. The birds had given good advice time out of mind, and brought many a general and a magiſtrate, as well as private men without number,

out

out of difficulties; and therefore, whether they wintered in Ægypt or not, ſignified little; and indeed it was only ſuppoſing them to go a little further, viz. into Æthiopia, and there they might meet Jupiter at his annual viſit, μεθ' ἀμυμονας Αιθιοπηας, and have the gift of prophecy conferred upon them, or confirmed. Agreeably to theſe notions we find ſeveral birds were looked upon as ſacred to particular gods; thus the owl to Minerva, the peacock to Juno, the eagle to Jupiter, the crow to Apollo whoſe meſſenger he was called as appears by Heſiod.

Some will be apt to think that i have dwelt much longer upon this ſubject than it deſerved; but i cannot help thinking, that even the infirmities of the human mind, eſpecially ſuch as have like this prevailed amongſt the moſt ingenious and ſagacious people we read of, and for a long courſe of time influenced their moſt ſerious concerns, ought to be looked upon as not below our notice.

It may ſeem wonderful to ſome, that naturaliſts have been ſo long without being able to determine any thing certain about the ſtate of ſeveral birds when they diſappear. The beſt writers have given it as their opinion, that *ſwallows* lye under water all winter; one of the lateſt ornithologiſts, a writer of great character, falls into this opinion, and the author of the following Calendar adopts it; and indeed till Monſ. Adanſon cleared up this point, it muſt appear a problematical point to any man. But though the migration of this bird is at laſt determined, yet what becomes of the *nightingale*, the *cuckow*, the *goat-ſucker*, and ſeveral others, is ſtill undecided.

Nor is this wonderful, though it may ſeem ſo; for the generality of mankind, and eſpecially thoſe who travel merely for the ſake of a livelihood or a fortune, are ſo little ſolicitous about things of this kind, that the air might be filled with *ſwallows* in winter without their obſerving it, as was plainly the caſe at Senegal.

The number of birds that diſappear in this kingdom is much greater than is generally imagined; eſpecially if we reckon amongſt them the birds which ſhift quarters at different ſeaſons, but do not croſs the ſeas. I ſhall not attempt to give a liſt of them, but recommend it to the curious, who live in the countrey the year round to watch them more narrowly than they have hitherto been. Linnæus ſays, that moſt of that genus of birds, which he calls *motacillæ*, i. e. *thoſe ſmall birds, which have a beak ſubulated and ſtrait, with chaps nearly equal, noſtrils of a pointed oval form, and tongue jaggedly indented*, live upon inſects and not grain; and therefore migrate from the northern to the ſouthern parts towards winter; but it appears, that many birds migrate not only in Sweden, but in Greece and other climates, that live with us all the year round.

It is poſſible, that after all i have ſaid, tending to revive natural augury, and after all the neceſſary obſervations ſhall have been regiſtred, that no uſe can be made of it; but i am certain, that as long as men have ears and eyes, they muſt think that one of the greateſt delights of the countrey, eſpecially during the ſpring months, is owing to the lively motions, beautiful ſhapes and colours and melodious notes of birds, which will

will afford more pleaſure as they are more obſerved; and therefore, i am not ſurpriſed, that Peter the Great of Muſcovy, did not think it beneath his attention to endeavour to enliven his new ſeat of empire, by ſending for colonies of them from other parts, as they were ſcarce where he reſided.

I will finiſh this digreſſion with a reflection that occurs to me on the different fates of natural and religious augury. The firſt was ſimple, unattended with any of thoſe circumſtances that are apt to rouſe the paſſions of man; and therefore, tho' likely to prove uſeful, if purſued with proper diligence, fell into neglect. The latter was complicated, applying itſelf to ſome of the ſtrongeſt paſſions in man, and therefore, though unlikely to a ſerious mind, to have the leaſt foundation in truth, or ever to be uſeful, was encouraged and adorned with all the pomp that a ſuperſtitious people could invent in honor of a flattering, and therefore favorite art.

I ſhall now come to ſome points that more immediately relate to the following Calendars.

1. I have retained the Linnæan names of every plant, and animal in the Swediſh Calendar; and have added the Engliſh names to the plants taken from Ray's Synopſis, and his hiſtory, with no ſmall trouble, as any one will eaſily believe who has done the like *. The numbers which follow the Engliſh names refer to the abovementioned books with an H. to diſtinguiſh the

* This trouble we ſhall for the future be relieved from, when that accurate and ſkilful botaniſt, Mr. Hudſon, has publiſhed his Flora Anglica, which is now in the preſs.

hiſtory. The numbers after the Engliſh names of animals refer either to his Hiſtoria Avium, or Piſcium, according to the ſubject §. I choſe to refer to Ray, as well as barely give the Engliſh names, for the eaſe and ſatisfaction of ſuch as put a due value on that ineſtimable writer, whoſe works do honor to our nation, as a late diſciple of the great Swediſh naturaliſt juſtly obſerves. I cannot help ſaying farther upon this occaſion, that no writer till his time ever advanced all the branches of natural hiſtory ſo much as that ſagacious, accurate, and diligent Engliſh obſerver, whoſe ſyſtematical ſpirit threw a light on every thing he undertook, and contributed not a little to thoſe great and wonderful improvements, which have been ſince introduced.

2. I have omitted moſt of the plants which are not natives of England, both becauſe it is not eaſy to find Engliſh names for them which have any authority, and becauſe i had ſcarcely any obſervations in my own Calendar, but on ſuch plants as are native. Some foreign ones however i have retained, particularly ſuch as are common in almoſt every garden; and ſuch as are marked in the Calendar, as more than ordinary prognoſtic. Theſe laſt are printed in large characters.

3. I have retained the diviſion of months according to budding, leafing, flowering, &c, tho' i could not imitate this method in my own Calendar for want of more experience; but i am

§ Some perhaps may think that i need not have referred to Ray for birds ſo well known as ſeveral mentioned in the Calendars; but the want of this caution in many authors, has produced great confuſion and doubt about the things meant in every branch of natural hiſtory.

convinced

convinced that this method marks more preciſely when we may expect the flowering of any plant, or the return of any bird, &c. than the bare mention of the day of a common calendar month, and at the ſame time marks it more univerſally. Thus when Ariſtotle ſays *, That the nightingale ſings continually day and night for fifteen days about the time when the young leaves begin to expand and thicken the woods, he not only marks the time when they might expect to hear the nightingale in Greece, but in every other countrey; for thus it happens in Sweden and England, as may be ſeen in the following Calendars; whereas if he had ſaid, it appeared in ſuch a day of the month, it would bear true perhaps for that year only; and in fact we find in the old almanacks the ſame author marking days very diſtant from one another, for the appearance of the ſame birds, and thus it muſt be likewiſe in relation to plants.

Thus far for the Swediſh Calendar. As to my own, 1ſt. i have marked every circumſtance down as i found it in my journal, and hope the learned reader will pardon any miſtakes which might happen, either from want of judgment or attention. It is poſſible that i might put down ſome plants as firſt being in bud, or flower, or

* His words are ὅταν τὸ ὄρος ηδὴ δασυνηται. i. e. when the mountain is thickening, where it is certain the word *mountain* is uſed for the trees which generally grow upon it. Thus Homer applies the word σκιοεντα to ὑρεα for that reaſon. Iliad. A. 157. and Euſtathius upon the place ſays, ἰστεον δὲ ὁτι, σκιοεντα μεν, ἀπο τῦ παρεχολυθοντος, λεγει. τα δασεα ἡ σκιας ἀποτελεσικα διὰ το τῆς ὑλης λασιον.

Pliny tranſlates this paſſage, *denſante ſe frondium germine.*

leaf, becauſe i happened then firſt to obſerve them, or they might be in thoſe ſtates ſome time before in ſome place where i happened not to go.

2. I wanted ſuch a guide as the ingenious author of the Swediſh Calendar. My obſervations then perhaps might have been leſs unworthy of the public, as they would have been better directed to a particular purpoſe; but now the reader muſt expect to find in it all the imperfections that generally accompany firſt attempts of any kind.

3. I have cauſed all the prognoſtic plants, which are mentioned in my Calendar, to be printed in large letters as in the Swediſh. The other marks i ſhall explain in a page by itſelf, for the more eaſy recurring to it.

4. Theſe two Calendars would perhaps upon compariſon have furniſhed me with ſome obſervations, had i been able to find time ſufficient for that purpoſe; but a ſtrong deſire to communicate them to the public early in the year, that others might be induced to keep journals of the ſame kind, determined me to ſend them out in this naked condition; and the more ſo, as i am aſſured on very good authority, that ſuch journals will be kept in Sweden, Germany, Italy, and France, the next year; and i think it would be pity, that an opportunity ſhould be loſt of making ſo curious a compariſon between theſe different climates, and which perhaps may not occur again, or at leaſt not for many years.

5. The obſervations on heat and cold were made with a thermometer, marked in a way peculiar to myſelf. The degrees are thoſe of Farenheit, which i choſe as being in common uſe,

but

out inſtead of 32, i have made o the freezing point. This method is more ſimple, natural, and uniform, and conveys a more diſtinct idea to the mind. To this ſcale i have reduced the Swediſh author's obſervations, as well as thoſe of Dr. Hales, taken from his Vegetable Statics; who i am pleaſed to find has made uſe of the method above-mentioned, in his late works, and i wonder it is not univerſally adopted. The degrees below o i have marked thus,—1.—2.—3, &c.

6. My botanical obſervations were made on plants growing in the fields chiefly; the Swediſh plants growing in the Upſal garden; which method is beſt, where either is in our power, i cannot determine. There are conveniencies and inconveniencies attending each; but there is one great convenience viſibly on the ſide of the garden; which is, that the plants lye within a ſmall compaſs, and therefore may be looked over more ſurely and regularly every day.

7. I once deſigned to place the two Calendars over-againſt one another, in oppoſite pages, part by part, according to the days of the month, but upon conſideration i found, the climates being ſo different, that there would be great vacancies in many of the pages; at the ſame time that the ſame plants would be in different pages, and the bulk of the book would be increaſed without any advantage to the reader; i therefore thought it would be better to make an index, which will furniſh an eaſy method to the curious of comparing the two climates.

8. If ever any uſe be made of Calendars of this kind, it muſt be by finding out, after a long ſeries of obſervations, and publiſhing by itſelf a

liſt of a few regularly prognoſtic plants, either common in every field, if native; or, if not native, common in every garden. For it muſt be noted, that many plants will blow even in the depth of winter, if the weather be mild. This is the caſe of *dandelion*, *chickweed*, *ſhepherd's purſe*, *daiſy*, &c. As for other precautions, I will refer the reader to the piece concerning the leafing of trees in the Amæn. Academ.

This Calendar was made at the hoſpitable ſeat of my very worthy and ingenious friend, Mr. Marſham, who has likewiſe made obſervations of this kind, and lately communicated to the world his curious obſervations on the growth of trees. All the countrey about is a dead flat; on one ſide is a barren black heath, on the other a light ſandy loam; partly tilled, partly paſture land ſheltered with very fine groves.

THE

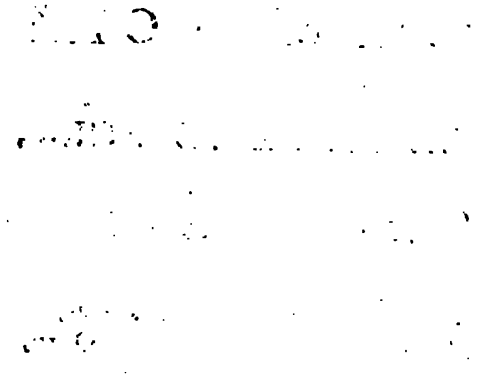
THE

CALENDAR of FLORA.

By ALEXAND. MAL. BERGER,

Upſal 1755. Latitude 59. 51. $\frac{1}{2}$

Poma dat autumnus, formoſa eſt meſſibus æſtas,
Ver præbet flores. OVID.



INTRODUCTION.

BEFORE i ſet forth the Calendar of Flora, or the delights of the year, ariſing from mere ſublunary things according to its progreſs, and that from obſervations made in the climate of Upſal, ann. 1755, i think it neceſſary to ſay ſomething by way of introduction. Time moves on ſlowly; every thing is in progreſſion and motion, and has its allotted time, as the wiſeſt of men Solomon obſerves; to which purpoſe Virgil ſays, *Stat ſua cuique dies.*

Aſtronomers have exerted all their power to meaſure time. To them we owe the accurate diviſions of it; for they by obſerving the courſe and motion of the celeſtial bodies, have been at laſt enabled to reduce it to ſtated periods, and to divide it in ſuch a manner into years, months, weeks and days, that we have calendars conſtructed for common uſe, as a rule by which to obſerve and number its equal parts.

As the ſtars radiate, ſhine, and adorn the celeſtial regions of the ſummer months, ſo flowers beautify and illuminate the earth with a wonderful variety of bright and delightful colors. Thus, according to the ſtile of the chymiſts, that which is above is as that which is below.

How much time ſoever and labor botaniſts have beſtowed for many ages back, in order to know the names, nature and vertues of plants, they have not hitherto arrived at that degree of perfection, as to be able to equal the ſucceſs of aſtronomers, in noting the properties and phænomena of each of them.

Every

Every flower has its appointed ſeaſon. It would therefore be in vain for us to ſeek the ſpring plants in autumn, and the autumn plants in the ſpring. We ſee them at ſtated times emerging, ſtalking, flowering, fruiting, decaying. Again in another ſeaſon we ſee others riſing in their room, and that in ſo ſhort a time, by ſo regular and conſtant a law, according to the direction of their natures, that it ſeems impoſſible for any one to behold this ſeries and variety, without the higheſt admiration.

The ſun at the ſame time that it raiſes, as it were, to life theſe beings, that are deſtitute of animal functions, brings them forth alſo ſooner or later, according to the nature and diſpoſition of each, i. e. as this or that plant requires a leſſer or a greater degree of heat, before it can obtain its juſt maturity. For as eggs, differing in ſpecies, when ſit on by a hen, will not all be hatched the ſame day, but ſome ſooner, ſome later, ſo neither do flowers come forth together, but at ſtated times, as they ſhall have received the degree of heat proper to their natures.

Altho' the year was formed by the Creator in ſuch a manner, as to be divided into diſtinct parts, by the ſun ſending forth its rays equally on the ſurface of the earth, yet we are not therefore from thence to define and meaſure the ſummer, the quantity of ice and ſnow and Northern colds hindering the air from being equally ſoon warmed in different years; and according to the heat of the air, the ſeaſons are advanced or retarded, and this is beſt known and meaſured by the various kinds of flowers.

Since therefore the ſummer ſeaſon depends upon

upon the greater or leſſer degree of heat, ſo that flowers come forth proportionably to thoſe different degrees, but yet in ſuch a manner, that one ſpecies follows another in a regular order; ſince this is the caſe, i ſay, the ſeaſons of the year, and particularly the ſummer, may eaſily from thence be meaſured; which hitherto has been a deſideratum, on account of œconomical uſes, in ſpite of all the aſſiſtance from aſtronomers.

Hence plants in different years often flower a month ſooner or later, although, as i obſerved before, they ſtill follow one another in their natural order, as far as the ſummer ſolſtice; at which time they hardly ever differ in any year; and in the ſame manner they proceed, haſten on, or are retarded, the nearer they approach towards autumn, and the winter is farther off, or nearer at hand. Now in order to determine accurately the acceleration or retardation of the winter, we muſt obſerve all the different kinds of flowers in every place, at what time they firſt appear, and this daily, that the order which they obſerve may be better aſcertained.

By way of ſpecimen i have exhibited the flowers in the ſame order in which they appeared the laſt year, 1755, in the Upſal garden. I muſt obſerve, that almoſt all the plants mentioned in the following calendar grew in the open air, and in the ſame kind of ſoil, which is low and loamy, excepting about half a ſcore, which were gathered in the woods not far diſtant, and which are with difficulty raiſed in the garden.

I have marked the month and day all along on

on the ſide of the page, not meaning that any one ſhould thence imagine that the flowers will return every year on the ſame day and month, but with intent to ſet forth the calendar of that individual year, and that it might appear with what diligence and circumſpection it was made.

In order to diſtinguiſh the cultivated plants from the wild, i have uſed italics for the firſt, and have marked the plants which appear to be moſt prognoſtic by an aſteriſk *.

I have beſides thought fit to diſpoſe them all into months, according to a diviſion the apteſt i could contrive; but i did not think it neceſſary to form equal months, as my deſign was not to determine days, but chiefly and indeed only the greater or leſſer acceleration of ſummer.

Having ſo accurately obſerved the flowers, i thought fit to add the time at which the animal kingdom undergoes certain alterations, ſuch as when birds of paſſage come and go, when birds of every kind lay, or hatch, or moult, when ſeveral kinds of fiſhes celebrate their nuptials near the ſea ſhore, when it is ſowing time, when grain flowers, ripens, &c.

By the help of ſuch obſervations we may at laſt come to know what is to be done, or obſerved, every day, by the flowering of plants. But much time is required to bring this to perfection; and he who obſerves, muſt, if he means to do any thing to the purpoſe, live in the countrey, where it is much eaſier to ſee every thing that preſents itſelf.

* Inſtead of an aſteriſk i have uſed great letters.

If the gentlemen of our own or other countries, took delight in ſuch obſervations, they might amuſe themſelves very agreeably, by giving up ſome of their time to things of this kind; and I am moſt certainly perſuaded, that this ſo ſlight a ſketch, gaining continually new additions, would at laſt produce a work of great uſe; as it might furniſh materials for directing private œconomy, and the more ſo as the times for ſowing of ſeeds, for reaping, and mowing, and for gathering fruits of various kinds, might from thence be beſt ſettled.

Gardeners might thence learn at what time of the ſpring they ought to lay the roots of plants bare, when to ſow their ſeeds, when to expoſe to the open air, and when to put under ſhelter their tender plants, and how to furniſh the garden with flowering plants; ſo that there might be a perpetual blow all poſſible months of the year; thus the *lilac* follows the *cherry*, the *mock orange* follows the *lilac*, and the *late roſes* follow the *mock orange*.

THE ORDER OF BLOWING OF THE BULBOUS PLANTS IN BORDERS, AND THEIR DURATION. N. B. The plants are numbered from the firſt day of budding, by the figures bered on the left hand, the other figures on the right hand ſhew the duration of their blow*.

* The meaning is this, as explained to me by Mr. Solander; ſuppoſe the *ſnow-drop* buds on any given day, then the *crocus* will bud the ſecond day after it, the *hyacinth* the twelfth day after it, &c.

1. Snow-

1. Snow-drops, 1144. H. Galanthus *nivalis*, 26.
Violet, *bulbous*, 1144. H. Leucoium *vernale*, 26.
2. Crocus, *ſpring*, 1174. H. Crocus *vernus*, 17.
12. Hyacinth, *oriental*, 1159. H. Hyacinthus *orientalis*, 18.
20. Fumitory, *bulbous*, 975. H. 4. Fumaria *bulboſa ſolida*, 20.
23. Hollow-root, 975. H. 5. Fumaria *bulboſa cava*, 20.
28Hyacinth,. *grape*, 1161. 28. H. Hyacinthus *botryoides*, 19.
34. Daffodil, *Engliſh*, 371. 2. Narciſſus *pſeudo-narciſſus*, 19.
Daffodil, *ſweet*, Narciſſus *odorus*, S. N. 19.
37. Crown, imperial, 1105. H. Fritillaria *imperialis*, 10.
Fritillary, *Pyrenean*, 1107. H. Fritillaria *Pyrenaica*, 14.
38. Lilly, *chequer'd*, 1106. H. Fritillaria *meleagris*, 10.
44. Tulip, 1146. H. Tulipa *Geſneriana*, 13.
47. Primroſe, *peerleſs*, 1133. H. Narciſſus *poeticus*.
50. Hyacinth, *ſummer*, 1160. H. Hyacinthus *amethyſtinus*.
15. Hyacinth, *Spaniſh*, 1160. 21. H. Hyacinthus *cernuus*.
59. Star of Bethlehem, 1153. 9. H. Ornithogalum *umbellatum*.
68. Lilly, *fiery*, 1110. 3, 4, 5, 7. H. Lilium *viviparum*.
69. Moly, *yellow*, 1123. 4. H. Allium *moly*.
76. Martagon *of Pompony*, 1114. 7. H. Lilium *Pomponium*.
79. Star of Bethlehem, *ſpiked*, 1151. 1. H. Ornithogalum *Pyrenaicum*.

69. Moly,

80. Corn flag. 1168. H. Gladiolus *communis.*
81. Martagon, *common*, 1112. H. Martagon *vulgare*, 15.
86. Martagon, *white*, 1112. Martagon *album*, 13.
100. Lilly, *white*, 1109. H. Lilium *album.*
111. Hyacinth, *dun-coloured*, 1160. 22. H. Hyacinthus *ſerotinus.*
113. Saffron, *meadow*, 373. Colchicum *autumnale.*

When many calendars of this kind ſhall be made in different places and nations in the ſame year, it will be eaſy to collect from the blowing of theſe ſorts of flowers, and from the leafing of trees, how one climate differs from another, and why plants brought from the Southern parts ſeldom produce fruit with us, whereas the Northern plants ſucceed very well. Thus at Montpelier the ſpring is forwarder than at Upſal by 31 days, at London by 28, at Falconia by 6; and the winter comes on as much later in thoſe places.

Botaniſts and apothecaries, whoſe buſineſs it is to gather plants juſt when they are in blow, may by this means learn at what time that may be done, and need not ſeek in vain at an improper ſeaſon, and may farther know by their garden plants what wild ones are to be found in the fields preciſely at the ſame time; and on the contrary.

The night froſts which ſo often deſtroy our plants, and which i imagine come to us from Lapland, may be known in the ſame way.

Thus the LEAD cold ariſing from the thaws in Lapmarck, happens at the end of the leafing ſeaſon.

MARKS EXPLAINED.

b ſignifies buds ſwelled.
B - - - - buds beginning to open.
f - - - - - flowers beginning to open.
F - - - - flowers full blown.
l - - - - - leaves beginning to open.
L - - - - leaves quite out.
r. p. - - - fruit nearly ripe.
R. P. - - fruit quite ripe.
E - - - - emerging out of the ground.
D - - - - flowers decayed.

THE CALENDAR of FLORA.

I. MONTH.

Reviving nature ſeems again to breath,
As looſen'd from the cold embrace of death.

Jan. 5. Roſemary, 515. H. Roſmarinus *officinal.* f.
11. Honeyſuckle, 458. Lonicera *periclymenum*, l.
23. Archangel, *red*, 240.2. Lamium *purpureum*, F.
Haſel nut tree, 439. Corylus *avellana*, f.
Honeyſuckle, 458. Lonicera *periclymenum*, L.
Lauruſtinus, 1690. H. Viburnum *tinus*, F.
Holly, 466. Ilex. *aquifolium*, f.
26. Snow drops, 1144. H. Galanthus *nivalis*, F.
Chickweed, 347.6. Alſine *media*, F.
Spurry, 351.7. Spergula *arvenſis*, F.
Daiſy, 184. Bellis *perennis*, F.

II. MONTH.

Love's pleaſing ferment gently now begins
To warm the flowing blood.

Feb. 4. WOOD LARK, 69.2. *Alauda arborea, ſings.*
Elder tree, 461. Sambucus *nigra*, f.
12. ROOKS, 39.3. *Corvus frugilegus, begin to pair.*
GEESE, 136.1. *Anas, anſer, begin to lay.*
*WAGTAIL WHITE, 75.1. *Motacilla alba, appears.*
16. THRUSH, 64.2. *Turdus muſicus, ſings.*
†CHAFFINCH, 88. *Fringilla cælebs, ſings.*
20. *Thermometer*, 11. *Higheſt this month.*
Thermometer, -2. *Loweſt this month.*
22. PARTRIDGES, 57. *Tetrao perdix, begin to pair.*
Haſel tree, 439. Corylus *avellana*, F.
25. Gooſeberry buſh, 1484. H. Ribes *groſſularia*, l. } both young plants.
Currant, *red*, 456.1. Ribes *rubrum*, l. } both young plants.
Thermometer from the 19th to the 25th, between 0 and -1 with ſnow.
Wind during the latter half of the month between E. and N.

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* The wagtail is ſaid by Willughby to remain with us all the year in the ſevereſt weather. It ſeems to me to ſhift its quarters at leaſt, if it does not go out of England. However, it is certainly a bird of paſſage in ſome countries, if we can believe Aldrovandus, the author of the Swediſh Calendar, and the author of the treatiſe De Migrationibus Avium. Linnæus obſerves, S. N. Art. Motacilla, that moſt birds which live upon inſects, and not grains, migrate.

† Linnæus ſays, that the female chaffinch goes to Italy alone, thro' Holland; and that the male in the ſpring, changing its note, foretells the ſummer: and Geſner, ornithol. p. 388. ſays that the female chaffinch diſappears in Switzerland in the winter, but not the male.

III. MONTH.

Winter ſtill ling'ring on the verge of ſpring,
Retires reluctant, and from time to time
Looks back, while at his keen and chilling breath
Fair Flora ſickens.

March

2. ROOKS, 39.3. *Corvus frugilegus, begin to build.*
   Thermometer, 10.
4. THRUSH, 64.2. *Turdus muſicus, ſings.*
   Thermometer, 11.
5. DOVE, RING, 62.9. *Columba palumbus, cooes.*
7. *Thermometer*, 0. *Loweſt this month.*
11. Sallow, Salix, F.
    Lauruſtinus, 1690. H. Viburnum *tinus*, l.
    *BEES, *Apis mellifera, out of the hive.*
    Laurel, 1549. H. Prunus *laurocerafus*, l.
    Bay, 1688. H. Laurus *nobilis*, l.
20. *Vernal equinox.*
21. Graſs, *ſcurvy*, 302.1. Cochlearia *officinalis*, F.
    Aſp, 446.3. Populus *tremula*, F.
26. Speedwell, *germander*, 279.4. Veronica *agreſtis*, F.
    Alder, 442. Alnus *betula*, F.
28. Violet, *ſweet*, 364.2. Viola *odorata*, F.
    Parſnep, *cow*, 205. Heracleum *ſphondylium*, E.
    Pilewort, 296. Ranunculus *ficaria*, F.

* Pliny, nat. hiſt. lib. 11. §. 5. ſays, that bees do not come out of their hives before May 11. and ſeems to blame Ariſtotle for ſaying that they come out in the beginning of ſpring, i. e. March 12,

March

28. *Thermometer*, 25.50. *Higheſt this month.*
29. Cherry tree, 463. Prunus *ceraſus*, B.
Currant buſh, 456.1. Ribes *rubrum*, B.
Primroſe, 284.1. Primula *veris*, F.
Yew tree, 445. Taxus *baccata*, F.
Elder, *water*, 460. Viburnum *opulus*, B.
Thorn, haw, 453.3. Cratægus *oxyacantha*, B.
Larch tree, 1405. H. Pinus *larix*, B.
Hornbeam, 451. Carpinus *oſtrya*, B.
Tanſy, 188. Tanacetum *vulgare*, E.

IV. MONTH.

———Airs, vernal airs,
Breathing the ſmell of grove and field, attune
The trembling leaves. MILTON.

April 1. Cheſnut, *horſe*, 1683. Æſculus *hippocaſtanum*, B.
BIRCH, 443. Betula *alba*, L.
Willow, *weeping*, Salix *Babylonica*, L.
ELM TREE, 468. Ulmus *campeſtris*, F.
Quicken tree, 452.2. Sorbus *aucuparia*, f.
Apricot, 1533. H. Prunus *Armeniaca*, F.
Narciſſus, *pale*, 371.2. Narciſſus *pſeudonar.*
3. Holly, 466.1. Ilex *aquifolium*, f.
Bramble, 467.1. Rubus *fruticoſus*, L.
Raſberry buſh, 467.4. Rubus *idæus*, L.
Currants, *red*, 456. Ribes *rubrum*, F.
Dandelion, 170.1. Leontodon *taraxicum*, E.

Cleavers,

April 3. Cleavers, 225. Galium *aparine*, E.
4. Lauruſtinus, 1690. H. Viburnum *tinus*, F.
APPLE TREE, 451.1,2. Pyrus *malus*, B.
Orpine 269.1. Sedum *telephium*, B.
Briar, 454.1. Roſa *canina*, L.
6. Gooſeberry, 1489. H. Ribes *groſſularia*, f.
Maple, 470.2. Acer *campeſtre*, B.
Peach, 1515. H. Amygdalus *Perſica*, L. et F.
Apricot, 1533. H. Malus *Armeniaca*, L.
Plumb tree, 462. Prunus *præcox*, L.
Pear tree, 452. Pyrus *communis*, B.
*SWALLOW, 71.2. Hirundo *urbica*, *returns*.
7. Filberd, 439. Corylus *avellana*, L.
Sallow, Salix, L.
Alder, 442. 1. Betula *alnus*, l.
Lilac, 1763. Syringa *vulgaris*, l.
Oak, 440.1. Quercus, *robur*, f.
Willow, *weeping*, Salix *Babylonica*, b.
8. Juniper, 444. Juniperus *communis*, b.
9. Lilac, 1763. Syringa *vulgaris*, b.
Sycamore, 470. Acer *pſeudoplatanus*, L.
Wormwood, 188.1. Artemiſia *abſinthium*, E.
†NIGHTINGALE, 78. *Motacilla luſcinia*, *ſings*.

* According to Ptolemy, Swallows return to Ægypt about the latter end of January.

† From morn 'till eve, 'tis muſic all around;
Nor doſt thou, Philomel, diſdain to join,
Even in the mid-day glare, and aid the quire.
But thy ſweet ſong calls for an hour apart;
When ſolemn Night beneath his canopy,
Enrich'd with ſtars, by Silence and by Sleep
Attended,

April

9. Auricula, 1082. H. Primula *auricula*, b.
10. Bay, 1688. H. Laurus *nobilis*, L.
Hornbeam, 451. Carpinus *betulus*, b.
Willow, *white*, 447.1. Salix *alba*, b.
BEES *about the male ſallows.*
Feverfew, 187.1. Matricaria *Parthenium*, E.
Dandelion, 170.1. Leontodon *taraxicum*, F.
Hound's tongue, 226.1. Cynogloſſum *officinale*, E.
Elm, 468. Ulmus *campeſtris*, l.
ANEMONE, *wood*, 259. Anemone *nemoroſa*, F.
Jack in the hedge, 291. Eryſimum *alliaria*, E.
Quince tree, 1452. H. Pyrus *cydonia*, L.
11. Elder, *water*, 460. Viburnum *opulus*, L.
Alder, *berry bearing*, 465. Rhamnus *frangula*, L.
12. Acacia, 1719. H. Robinia *acacia*, l.
Mulberry tree, 1429. H. Morus *nigra*, l.
Lime tree, 473.1,2,3. Tilia *Europæa*, l.
Mercury, *dogs*, 138.1. Mercurialis *perennis*, F.
* Elm, *wych*, 469.4. L.
Ragweed, 177. Senecio *jacobæa*, E.

Attended, ſits and nods, in awful ſtate;
Or when the Moon in her refulgent car,
Triumphant rides amidſt the ſilver clouds,
Tinging them as ſhe paſſes, and with rays
Of mildeſt luſtre gilds the ſcene below;
While zephyrs bland breath thro' the thickening ſhade,
With breath ſo gentle, and ſo ſoft, that e'en
The poplar's trembling leaf forgets to move,
And mimic with its ſound the vernal ſhower;
Then let me ſit, and liſten to thy ſtrains, &c.

* Linnæus does not ſeem to know this ſpecies of elm.

April

13. Laburnum, 1721. Cytiſus *laburnum*, f.
Strawberry, 254. Fragaria *veſca*, F.
Quicken tree, 452.2. Sorbus *aucuparia*, L.
Sycomore, 470. Acer *pſeudoplat.* L.
Laurel, 1549. H. Prunus *lauroceraſus*, L.
Gooſeberry buſh, 1484. H. Ribes *groſſularia*, F.
Currant buſh, 456.1. Ribes *rubrum*, F.
Mallow, 251.1. Malva *ſylveſtris*, E.
Hornbeam, 451. Carpinus *betulus*, L.

14. Flixweed, 298.3. Siſymbrium *ſophia*, E.
Apple tree, 451. Pyrus *malus*, L.
Hops, 137.1. Humulus *lupinus*, E.
Plane tree, 1706. H. Platanus *orientalis*, b.
Walnut tree, 438. Juglans *regia*, f.
BITTERN, 100.11. Ardea *ſtellaris makes a noiſe.*

15. Vine, 1613. Vitis *vinifera*, B.
Turneps, 204.1. Braſſica *rapa*, F.

16. Abele, 446.2. Populus *alba*, B.
Cheſnut, 138.2. H. Fagus *caſtanea*, B.
Ivy, *ground*, 243. Glechoma *hederacea*, F.
Fig tree, 1431. Ficus *carica*, b.
Apricots and peaches out of blow.
RED START, 78.5. Motacilla *Phœnicurus, returns.*
Tulip tree, 1690. H. Liriodendron *tulipifera*, B.
Plumb tree, 462. Prunus *domeſtica*, F.
Sorrel, *wood*, *281.1,2. Oxalis *acetoſella*, F.
Marygold, *marſh*, 272. Caltha *paluſtris*, F.
Laurel, *ſpurge*, 465. Daphne *laureola*, F.

17. Jack in the hedge, 291.2. Eryſimum *alliaria*, F.

April

17. Willow, *white*, 447. 1. Salix *alba*, L. et F.
Cedar, 1404. H. Pinus *cedrus*, l.
Elder, *water*, 460.1. Viburnum *opulus*, f.
Abele, 446.2. Populus *alba*, L.
*CUCKOW, 23. Cuculus *canorus*, *fings.*

18. Oak, 440.1. Quercus, *robur*, l. F.
Thorn, *black*, 462.1. Prunus *ſpinoſus*, B.
Pear tree, 452. Pyrus *communis*, f.
Mulberry tree, 1429. H. Morus *nigra*, B.
Violet, *dog*, 364.3. Viola *canina*, F.
Lime tree, 413.1,2,3. Tilia *Europæa*, L.
Nightſhade, 265. Atropa *belladonna*, E.
Cherry tree, 463.1. Prunus *ceraſus*, F.
Aſh tree, 469. Fraxinus *excelſior*, f.
Maple, 470. Acer *campeſtre*, L.
Broom, 474. Spartium *ſcoparium*, b.
Cheſnut, 138.2. Fagus *caſtanea*, L.
Fir, *Scotch*, 442. Pinus *ſylveſtris*, b.
Cuckow flower, 299. Cardamine *pratenſis*,

20. *Thermometer* 42. *the higheſt this month.*

21. Walnut tree, 438. Juglans *regia*, L.
Plane tree, 1706. H. Platanus *orientalis*, L.
Fir, *Weymouth*, 8. dend. Pinus *tæda*, B.
Acacia, 1719. H. Robinia *pſeudo-acacia*, L.
Fig tree, 1431. H. Ficus *carica*, L.
Wall flower, 291. Cheiranthus *cheiri*, F.
Poplar, *black*, 446.1. Populus nigra, L.
Beech tree, 439.1. Fagus *ſylvatica*, L.

22. Fir, *balm of Gilead*, Pinus *balſamea*, l. et f.

* Ariſtophanes ſays, that when the cuckow ſung the Phœnicians reaped wheat and barley. Vid. Aves.

Young

April

22. *Young Apricots.*
Fir, *Scotch*, 442. Pinus *ſylveſtris*, f.
Ash, 469. Fraxinus *excelſior*, F. et L.
Broom, 474. Spartium *ſcoparium*, L.
Poplar, *Carolina.* L.
Meadow ſweet, 259. Spiræa *ulmaria*, E.
Fig tree, 1431. H. Ficus *carica*, *fruit formed.*
Tormentil, 257.1. Tormentilla *erecta*, E.
Phyllerea, 1585. H. Phyllerea *latifolia*, F.
Thorn, *evergreen*, 1459. H. Meſpilus *pyracantha*, F.
Roſemary, 515. H. Roſmarinus *officinalis*, F.
Campion, *white*, 339.8. Lychnis *dioica*, F.
Buckbean, 285.1. Menyanthes *trifol.* F.
Furze, *needle*, 476.1. Geniſta *Anglica*, F.
Stitchwort, 346.1. Stellaria *holoſtea*, F.

23. Crab tree, 451.2. Pyrus *malus ſylv.* F.
Apple tree, 451.1. Pyrus *malus*, f.
Robert, *herb*, 358. Geranium *Robertian*, F.
Fieldfares, 64.3, *Turdus pilaris*, *ſtill here.*

24. Broom, 474. Spartium *ſcoparium*, F.
Mercury, 156.15. Chenopodium *bonus henr.* F.
Yew tree, 445. Taxus *baccifera*, L.
Holly, 466.1. Ilex *aquifolium*, B.
Furze, 475. Ulex *Europæus*, l.
Agrimony, 202. Agrimonia *eupator*, E.

25. Sycomore, 470. Acer *pſeudoplat.* F.
Hornbeam, 451. Carpinus *betulus*, F.
Aſp, 446. Populus *tremula*, l.
Spurge, *ſun*, 313.8. Euphorbia *peplus*, F.
Elder tree, 461.1. Sambucus *nigra*, f.
Nettle, 139. Urtica *dioica*, F.

April

25. Bindweed, *ſmall*, 275.2. Convolvulus *arvenſ.* E.
Fir, *balm of Gilead*, Pinus *balſamea*, L.
Cicely, *wild*, 207.1. Chærophyllum *ſylveſtre*, F.
Young currants and gooſeberries.

26. Plantain *ribwort*, 314.5. Plantago *lanceol.* F.
Germander, *wild*, 281.11. Veronica *chamæd.* F.
Cuckow pint, 266. Arum *maculatum*, *ſpatha out.*
Holly, 466. Ilex *aquifolium*, F.
Harebells, 373.3. Hyacinthus *nonſcript.* F.

27. LILAC, 1763. H. Syringa *vulgaris*, F.
Crane's bill, *field*, 357.2. Geranium *cicutar.* F.
St. John's wort, 342.1. Hypericum *perforat.* E.
Betony *water*, 283.1. Scrophularia *aquat.* E.
Bryony, *white*, 261. Bryonia *alba*, E.
Birch tree, 443.1. Betula *alba*, F.

28. Jeſſamine, 1599.1. H. Jaſminum *officinale*, l.
Thorn, *white*, 453.3. Cratægus *oxyacantha*, f.
*BLACK CAP, 79.12. *Motacilla atracapilla*, *ſings.*

* The black cap is a very fine ſinging bird, and is by ſome in Norfolk called the mock nightingale. Whether it be a bird of paſſage I cannot ſay.

WHITE

April

28. * WHITE THROAT, 77. Motacilla *ſylvia*,
Juniper, 444.1. Juniperus *communis*, f.
Raſberry buſh, 467.4. Rubus *idæus*, f.
Quince tree, 1452. H. Malus *Cydon.* f.
Crowfoot, *ſweet wood*, 248.1. Ranunculus *auric.* F.

29. Bugle, 245. Ajuga *reptans*, F.
Bay, 1688. H. Laurus *nobilis*, f.
Peas and beans, f.
Snow.
Chervil, *wild*, 207.1. Chærophyllum *temulent.* f.
Parſnep, *cow*, 205.1. Heracleum *ſphondyl.* f.
Pine, *manured*, 1398.1. H. Pinus *pinea*, f.

30. *Snow.*
†*Thermom. 5. The loweſt this month.*

* I have ſome doubt whether this bird be the Sylvia of Linnæus, though the deſcription ſeems to anſwer to Ray's, and to one of my own, which I find among my papers.

† Vernal heat, according to Dr. Hales, at a medium, is 18.25.

V. MONTH.

All that is ſweet to ſmell, all that can charm
Or eye or ear, burſts forth on every ſide,
And crouds upon the ſenſes.

May 1. Croſswort, 223.1. Valantia *cruciata*, F.
Avens, 253.1. Geum *urbanum*, F.
Mugwort, 191.1. Artemiſia *campeſtris*, E.
Bay, 1688. H. Laurus *nobilis*, L.

Lilly

May 3. Lilly of the valley, 264. Convallaria *Maialis*, f.
Violet, *water*, 285. Hottonia *paluſtris*, F.
4. Lettuce *lambs*, 201. Valeriana *locuſta*, F.
Tulip tree, Liriodendron *tulipifera*, L.
Hound's tongue, 226.1. Cynogloſſum *officinale*.
Cowſlips, 284.3. Primula *veris*, F.
Valerian, *great wild*, 200.1. Valerian *officinalis*, F.
Rattle, *yellow*, 284.1. Rhinanthus *criſta galli*, F.
Ice.
Thermom. 8. *The loweſt this month.*
Fir, *ſilver*, *buds hurt by the froſt.*
5. Twayblade, 385. Ophrys *ovata*, f.
Tormentil, 257. Tormentilla *erecta*, F.
Celandine, 309. Chelidonium *majus*, E.
Betony, 238.1. Betonica *officinalis*, E.
6. Oak, 440. Quercus, *robur*, F. et L.
Time for ſowing barley.
Saxifrage, *white*, 354.6. Saxifraga *granulata*, F.
Aſh, 469. Fraxinus *excelſior*, f.
Ramſons, 370.5. Allium *urſinum*, F.
Nettle, *white*, 240.1. Lamium *album*, F.
Quicken tree, 452.2. Sorbus *aucuparia*, F.
7. Fir, *Scotch*, 442. Pinus *ſylveſtris*, F.
8. Woodruffe, 224. Aſperula *odorata*, F.
9. Cheſnut tree, 1382. H. Fagus *caſtanea*, f.
10. Celandine, 309. Chelidonium *majus*, F.
Solomon's ſeal, 664. Convallaria *polygonat.* F.
Thorn, *white*, 453.3. Cratægus *oxyacantha*, F.

Maple,

May

11. Maple, 470.2. Acer *campeſtre*, F.
Roſes, *garden*, f.

12. Barberry buſh, 465. Berberis *vulgaris*, F.
Cheſnut, *horſe*, 1683. H. Æſculus *hippocaſtas*, F.
Bugloſs, *ſmall wild*, 227.1. Lycopſis *arvenſis*, F.

13. Graſs, *water ſcorpion*, 229.4. Myoſotis *ſcorpioid*, F.
Quince tree, 1452. H. Pyrus *Cydonia*, F.
Cleavers, 225. Galium *aparine*, F.

14. Mulberry tree, 1429. H. Morus *nigra*, L.
Aſp, 446.3. Populus *tremula*, l.
Crowfoot, *bulbous*, 247.2. Ranunculus *bulbos*. F.
Butter cups, 247. Ranunculus *repens*, F.

15. *Young turkies.*
Lime tree, 473. Tilia *Europæa*, f.
Milkwort, *287.1,2. Polygala *vulgaris*, F.
Crane's bill, 359.10. Geranium *molle*, F.
Walnut, 1376. H. Juglans *regia*, F.

16. Muſtard, *hedge*, 298.4. Eryſimum *officinale*, F.

20. Bryony, *black*, 262.1. Tamus *communis*, F.
Many oaks, and more aſhes and beeches, ſtill without leaf.
Violet, *ſweet*, 364.1. Viola *odora*, D.
Stitchwort, 346. Stellaria *holoſtea*, D.
Anemone, *wood*, 259,1. Anemone *nemoroſa*, D.
Cuckow flower, 299.20. Cardamine *pratenſis*, D.
Earth nut, 209. Bunium, bulbocaſt. F.
Mulberry tree, 1429. H. Morus *nigra*, f.

Night-

May

21. Nightſhade, 265. Atropa *belladonna*, f.
Rye, 288. Secale *hybernum*, *in ear*.
23. Pellitory *of the wall*, 158.1. Parietaria *officin.* F.
24. Bramble, 467. Rubus *fruticoſus*, f.
25. Moneywort, 283.1. Lyſimachia *nummul.* F.
Columbines, 173.1. Aquilegia *vulgar.* F. *in the woods.*
26. Tanſy, *wild*, 256.5. Potentilla *anſerina*, F.
Henbane, 274. Hyoſcyamus *niger*, F.
27. Campion, *white*, 339.8. Lychnis *dioica*, F.
Clover, 328.6. Trifolium *pratenſe*, F.
28. Avens, 262.1. Geum *urbanum*, F.
Chervil, *wild*, 207. Chærophyllum *temulent*, F.
30. Bryony, *black*, 262.1. Tamus *communis*, F.
Brooklime, 280.8. Veronica *beccabunga*, F.
Cuckow flower, 338. Lychnis *flos cuculi*, F.
Creſſes, *water*, 300.1. Siſymbrium *naſturt.* F.
Thermom. 32. *Higheſt this month.*
31. Spurrey, 351.7. Spergula *arvenſis*, F.
Alder, *berry bearing*, 465. Rhamnus *frangula*, F.

VI. MONTH.

Now the mower whets his ſcythe,
And every ſhepherd tells his tale
Under the hawthorn in the dale. Milton.

June 2. Elder, *water*, 460.1. Viburnum *opulus*, F.
Lilly, *yellow water*, 368.1. Nymphæa *lutea*, F.

Flower

June 2. Flower de luce, *yellow water*, 374. Iris *pſeudo-acor*. F.

Mayweed, *ſtinking*, 185.3. Anthemis *cotula*, F.

Pimpernel, 282.1. Anagallis arvenſis, F.

3. Arſmart, 145.4. Polygonum *perſicaria*, F.

* Thyme, 430.1. Thymus *ſerpyllum*, F.

Parſnep, *cow*, 205. Heracleum *ſphondylium*, F.

Quicken tree 452. Sorbus *aucuparia*, D.

5. Radiſh, *horſe*, 301.1. Cochlearia *armorac*. F.

Thorn, *evergreen*, 1459.3. H. Meſpilus *pyracantha*, F.

Bramble, 467. Rubus *fruticoſus*, F.

† GOAT SUCKER, or FERN OWL, 27. Caprimulgus *Europæus, is heard in the evening*.

6. Vine, 1613. H. Vitis *vinifera*, b.

Flix weed, 298.3. Siſymbrium *ſophia*, F.

Raſberry buſh, 467.4. Rubus *idæus*, F.

Mallow, *dwarf*, 251.2. Malva *rotundifolia*, F.

Elder, 461.1. Sambucus *nigra*, F.

Stitchwort, *leſſer*, 346. Stellaria *graminea* F.

Tare, *everlaſting*, 320.3. Lathyrus *pratenſis*, F.

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* Pliny, lib. 11. §. 24. ſays, the chief time for bees to make honey is about the ſolſtice, when the vine and thyme are in blow. According to his account then theſe plants are as forward in England as in Italy.

† This bird is ſaid by Cateſby, as quoted by the author of the treatiſe De Migrationibus Avium, to be a bird of paſſage.

June 6. Gout *weed*, 208.3. Ægopodium *podagrar.* F.
Bryony, *white*, 261.1,2. Bryonia *alba*, F.
Rose, dog, 454.1. Rosa *canina*, F.
Bugloss *vipers*, 227.1. Echium *vulgare*, F.
7. Grass, *vernal*, 398.1. Anthoxanthum *odorat.* F.
Darnel, *red*, 395. Lolium *perenne*, F.
Poppy, *wild*, 308.1. Papaver *somnifer*, F.
Buckwheat, 181. H. Polygonum *fagopyrum*, F.
8. Pondweed, *narrow leaved*, 145.9. Polygonum *amphib.* F.
Sanicle, 221.1. Sanicula *Europæa*, F.
9. Eyebright, *284.1. Euphrasia *officinalis*, F.
Heath, *fine leaved*, 471.3. Erica *cinerea*, F.
Saxifrage, *bugle*, *hyacinth*, D.
Broom, 474.1. Spartium *scoparium*, *podded.*
Nettle, *hedge*, 237. Stachys *sylvatica*, F.
12. Wheat, 386.1. Triticum *hybernum*, *in ear.*
Meadow sweet, 259.1. Spiræa *ulmaria*, f.
Scabious, field, 191.1. Scabiosa *arvensis*, F.
Valerian, *great water*, 200.1. Valeriana *officinal.* f.
Cinquefoil, *marsh*, 256.1. Comarum *palustre*, F.
Orchis, *lesser butterfly*, 380.18. Orchis *bifolia*, F.
13. Willow herb, *great hairy*, 311.2. Epilobium *hirsutum*, F.
Parsnep, *cow*, 205. Heracleum *sphondyl.* F.
Betony, *water*, 283.1. Scrophularia *aquat.* F.

Cockle,

June

13. Cockle, 338.3. Agroſtemma *githago*, F.
Sage, 510.7. H. Salvia *officinalis*, F.

15. Mallow, 251.1. Malva *ſylveſtris*, F.
Nipplewort, 173 1. Lapſana *communis*, F.
Woodbind, 458.1, 2. Lonicera *periclymen.* f.
NIGHTINGALE *ſings.*

16. Fir, *Weymouth*, 8 dend. Pinus *tæda*, F.
Hemlock, 215.1. Conium *maculatum*, F.
Nightſhade, *woody*, 265. Solanum *dulcamara*, F.
Archangel, *white*, 240. Lamium *album*, F.

17. Vervain, 236. Verbena *officinalis*, F.
Agrimony, 202. Agrimonia *eupator*, F.
Hemlock, *water*, 215. Phellandrium *aquatic.* F.
Acacia, 1719. H. Robinia *pſeudo-acacia*, F.

18. Yarrow, 183. Achillea *millefolium*, F.

19. *Thermom.* 44.25. *Higheſt this month.*

21. Orache, *wild*, 154.1. Chenopodium *album*, F.
Solſtice. About this time ROOKS *come not to their neſt trees at night.*
Wheat, 386.1. Triticum *hybernum*, F.
Rye, 388.1. Secale *hybernum*, F.
Self-heal, 238. Prunella *vulgaris*, f.
Parſley, *hedge*, 219.4. Tordylium *anthriſcus*, f.
Graſſes of many kinds, as feſtuca, aira, agroſtis, phleum cynoſurus, in ear.

22. Horehound, *baſe*, 239. Stachys *Germanica*, F.

June

22. St. John's wort, 342. Hypericum *perforatum*, F.
Parſnep, 206.1. Paſtinaca *ſativa*, F.
Mullein, *white*, 287. Verbaſcum *thapſus*, F.
Poppy, *wild*, 308. Papaver *ſomnifer*, F.

23. Larkſpur, 708.3. H. Delphinium *Ajacis*, F.
Marygold, *corn*, 182.1. Chryſanthemum *ſeget*. F.

24. Roſemary, 515. H. Roſmarinus *officinalis*, D.

25. Vine, 1613. H. Vitis *vinifera*, F.
Bindweed, *great*, 275.2. Convolvulus *arvenſis*, F.
Feverfew, 187. Matricaria *parthenium*, F.
Woad, *wild*, 366.2. Reſeda *luteola*, F.
Rocket, *baſe*, 366.1, Reſeda *lutea*, F.
Archangel, *yellow*, 240.5. Galeopſis *galeobdolon*, F.
Wheat, 386.1. Triticum *hybernum*, F.
Thermom. 20. *The loweſt this month.*

27. *Clover mowed.*
Pennywort, *marſh*, 222. Hydrocotule *vulgaris*, F.
Meadow, *ſweet*, 259. Spiræa *ulmaria*, F.

28. Oats *manured*, 389. Avena *ſativa*, F.
Barley, 388. Hordeum *vulgare*, F.
Midſummer ſhoots of apricot, oak, beech, elm.
Succory, wild, 172.1. Cichorium *intybus*, F.
Blue bottles, 198. Centaurea *cyanus*, F.

June

28. Knapweed, *great*, 198. Centaurea *ſcabioſa*, F.

30. *Currants ripe.*

According to Dr. Hales, May and June heat is, at a medium, 28.5.

* The groves, the fields, the meadows, now no more
With melody reſound. 'Tis ſilence all,
As if the lovely ſongſters, overwhelm'd
By bounteous nature's plenty, lay intranc'd
In drowſy lethargy.

* I heard no birds after the end of this month, except the STONE CURLEW, 108.4. Charadrius Oedicnemus, whiſtling late at night; the YELLOW HAMMER, 93.2. Emberiza flava; the GOLDFINCH, 89.1. and GOLDEN CRESTED WREN, 79.9. Motacilla regulus, now and then chirping. I omitted to note down when the cuckow left off ſinging, but, as well as i remember, it was about this time. Ariſtotle ſays, that this bird diſappears about the riſing of the dog ſtar, i. e. towards the latter end of July.

VII. MONTH.

Berries and pulpous fruits of various kinds,
The promiſe of the blooming ſpring, now yield
Their rich and wholeſome juices, meant t'allay
The ferment of the bilious blood.

July 2. Beech, 439. Fagus *ſylvatica*, F.
Pearlwort, 345.2. Fagina *procumbens*, F.
Carrot, *wild*, 218. Daucus *carrota*, F.
Graſs, *dog*, 390.1. Triticum *repens*, *in ear.*
Violet, *Calathian*, 274. Gentiana *pneumonan.* F.

4. Silver weed, 256.5. Potentilla *anſerina*, F.
Betony, 238.1. Betonica *officinalis*, F.
Nightſhade, *enchanters*, 289. Circæa *lutetiana*, ſ.

July 6. Lavender, 512. Lavendula *ſpica*, F.
Parſley, *hedge*, Tordylium *anthriſcus*, F.
Gromill, 228.1. Lithoſpermum *officinale*, F.
Furze, 473. Ulex *geniſta*, D.
Cow wheat, *eyebright*, 284.2. Euphraſia *odont.* F.

7. Pinks, maiden, 335.1. Dianthus *delteides*, F.

8. Tanſey, 188.1. Tanacetum *vulgare*, f.
Bed-ſtraw, *lady's yellow*, 224. Galium *verum*, F.
Sage, *wood*, 245. Teucrium *ſcorodonia*, F.
Spinach, 162. H. Spinacia *oleracia*, F.
Thermom. 22. *Loweſt this month.*

9. Angelica, *wild*, 208.2. Angelica *ſylveſtris*, F.
Strawberries ripe.
Fennel, 217. Anethum *fæniculum*, F.

10. Beans, *kidney*, 884. H. Phaſeolus *vulgaris*, *podded.*
Parſley, 884. H. Apium *petroſelinum*, F.
Sun dew, *round leaved*, 356.3. Droſera *rotundifol.* F.
Sun dew, *long leaved*, 356.4. Droſera *longifol.* F.
Lilly, *white*, 1109. H. Lilium *candidum*, f.

11. Mullein, *hoary*, 288. Verbaſcum *phlomoid.* F.
Plantain, *great*, 314.1,2. Plantago *major*, F.
WILLOW, SPIKED, of Theophr. 1699. H. Spiræa *ſalicifol.* F.
Jeſſamine, 1599. H. Jaſminum *officinale*, F.
Reſt harrow, 332. Ononis *ſpinoſa*, F.

Hyſſop,

July

11. Hyſſop, 516. H. Hyſſopus *officinalis*, F.
Potatoes, 615.14. H. Solanum *tuberoſum*, F.
Second ſhoots of the maple.
Bell flower, *round leaved*, 277.5. Campanula, F.
LILLY, WHITE, 1109. H. Lilium *candidum*, F.
Raſberries ripe.
Figs yellow.

13. LIME TREE, 473. Tilia *Europæa*, F.
Knapweed, 198.2. Centaurea *jacea*, F.
Stonecrop, 269. Sedum *rupeſtre*, F.
Graſs, *knot*, 146. Polygonum *aviculare*, F.
Graſs, *bearded dog*, 390.2. Triticum *caninum*, F.

15. *Thermom.* 39. *Higheſt this month.*

16. Aſparagus, 267.1. Aſparagus *officinalis*, *berries.*
Mugwort, 190.1. Artemiſia *vulgaris*, F.

18. Willow herb, *purple ſpiked*, 367.1. Lythrum *ſalicaria*, F.
YOUNG PARTRIDGES.
Agrimony, *water hemp*, 187.1. Bidens *tripart.* F.

20. Flax, *purging*, 362.6. Linum *catharticum*, F.
Arſmart, *ſpotted*, 145.4. Polygonum *perſicaria*, F.
Lilly, *martagon*, 1112. H. Lilium *martagon.*
HENS *moult.*

22. Orpine, 269. Sedum *telephium*, f.
Hart's tongue, 116. Aſplenium *ſcolopendra*, F.

Penny

July

22. Pennyroyal, 235. Mentha *pulegium*, F.
Bramble, 461.1. Rubus *fruticoſus*. *Fruit red.*
Lauruſtinus, 1690. H. Viburnum *tinus*, f.

24. Elecampane, 176. Inula *helenium*, F.
Amaranth, 202. H. Amaranthus *caudatus*, F.

27. Bindweed, *great*, 275.1. Convolvulus *ſepium*, F.

28. Plantain, *great water*, 257.1. Aliſma *plantago*, F.
Mint, *water*, 233.6. Mentha *aquatica*, F.
Willow herb, 311.6. Epilobium *paluſtre*, F.
Thiſtle tree ſow, 163.7. Sonchus *arvenſis*, F.
Burdock, 197.2. Arctium *lappa*, f.
Saxifrage, *burnet*, 213.1,2. Pimpinella, *ſaxifraga*, F.
Devil's bit, 191.3. Scabioſa *ſucciſa*, F.

32. Nightſhade, common, 288.4. Solanum *nigrum*, F.
DOVE, RING, 62.9. Columba *palumbus*, *cooes.*

VIII. MONTH.

Pour'd from the villages, a numerous train
Now ſpreads o'er all the fields. In form'd array
The reapers move, nor ſhrink for heat or toil,
By emulation urg'd. Others diſpers'd,
Or bind in ſheaves, or load or guide the wain
That tinkles as it paſſes. Far behind,
Old age and infancy with careful hand
Pick up each ſtraggling ear, &c.

Auguſt

1. Melilot, 331.1. Trifolium *officinale*, F.
Rue, 874.1. Ruta *graveolens*, F.
Soapwort, 339.6. Saponaria *officinalis*, F.
Bedſtraw, *white*, *lady's*, 224.2. Galium *paluſtre*, F.
Parſnep, *water*, 300. Siſymbrium *naſturt.* F.
Oats almoſt fit to cut.

3. *Barley cut.*

5. Tanſy, 188.1. Tanacetum *vulgare*, F.
Onion, 1115. H. Allium *cepa*, F.

7. Horehound, 239. Marrubium *vulgare*, F.
Mint, *water*, 233.6. Mentha *aquat.* F.
Nettle, 139. Urtica *dioica*, F.
Orpine, 269.1. Sedum *telephium*, F.
NUTHATCH, 47. Sitta *Europæa*, *chatters.*

8. *Thermom.* 20. *Loweſt to the 27th of this month*

9. Mint, *red*, 232.5. Mentha *gentilis*, F.
Wormwood, 188.1. Artemiſia *abſinthium*, F.

12. Horehound, *water*, 236.1. Lycopus *Europæus*, F.
Thiſtle, *lady's*, 195.12. Carduus *marianus*, F.
Burdock, 196. Arctium *lappa*, F.
ROOKS *come to the neſt trees in the evening, but do not rooſt there.*

14. Clary, *wild*, 237.1. Salvia *verbenaca*, F.
STONE CURLEW, 108. Charadrius *oedicnemus whiſtles at night.*

15. Mallow, *vervain*, 252. Malva *alcea*, F.

Auguſt

15. GOAT SUCKER, 26.1. Caprimulgus *Europæus, makes a noiſe in the evening, and young owls.*

16. **Thermom. 35. The higheſt to the 27th of this month.*

17. Orach, *wild*, 154.1. Chenopodium *album.*
ROOKS *rooſt on their neſt trees.*
GOAT SUCKER, *no longer heard.*

21. *Peas and wheat cut.*
Devil's bit, *yellow*, 164.1. Leontodon, *autumnal.* F.

26. ROBIN RED BREAST, 78.3. Motacilla *rubecula, ſings.*
Goule, 443. Myrica *gale*, F. R.
Golden rod, *marſh*, 176.2. Senecio *paludoſus*, F.

29. Smallage, 214. Apium *graveolens*, F.
Teaſel, 192.2. Dipſacus *fullonum*, F.
Vipers come out of their holes ſtill.

IX. MONTH.

How ſweetly nature ſtrikes the raviſh'd eye
Thro' the fine veil with which ſhe oft conceals
Her charms in part, as conſcious of decay!

September

2. WILLOW HERB, *yellow*, 282.1. Lyſimachia *vulgaris*, F.
Traveller's joy, 258. Clematis *vitalba*, F.

* From the 27th of this month to the 10th of September I was from home, and therefore cannot be ſure that I ſaw the firſt blow of the plants during that interval.

Graſs

September

5. Graſs of Parnaſſus, 355. Parnaſſia *paluſtris.*

10. *Catkins of the haſel formed.*
Thermom. 17. *The loweſt from the* 10*th to the end of this month.*

11. *Catkins of the birch formed.*
Leaves of the Scotch fir fall.
Bramble ſtill in blow, though ſome of the fruit has been ripe ſome time; ſo that there are green, red, and black berries on the ſame individual plant at the ſame time.
Ivy, 459. Hedera *helix*, f.

14. *Leaves of the ſycomore, birch, lime, mountain aſh, elm, begin to change.*

16. Furze, 475. Ulex *Europæus*, F.
Catkins of the alder formed.
Thermom. 36.75. *The higheſt from the* 10*th to the end of this month.*
CHAFFINCH, 88. Fringilla *cælebs, chirps.*

17. *Herrings.*

20. FERN, FEMALE, 124.1, Pteris *aquilina, turned brown.*
Aſh, *mountain*, 452.2. Sorbus *aucuparia*, F. R.
Laurel, 1549. H. Prunus *laurocerasus*, f. r.
Hops, humulus *lupulus*, 137.1. f. r.

21. SWALLOWS *gone.* *Full moon.*

23. *Autumnal æquinox.*

25. WOOD LARK, 69.2. Alauda *arborea, ſings.*
FIELD FARE, 64.3. Turdus *pilaris, appears.*

Leaves

September.

25. *Leaves of the plane tree, tawny—of the haſel, yellow—of the oak, yellowiſh green—of the ſycomore, dirty brown—of the maple, pale yellow—of the aſh, fine lemon—of the elm, orange—of the hawthorn, tawny yellow—of the cherry, red—of the hornbeam, bright yellow—of the willow, ſtill hoary.*

27. BLACK BIRD *ſings.*

29. THRUSH, 64.2. Turdus *muſicus*, *ſings.*

30. *Bramble, 467.1. Rubus *fruticoſus*, F.

*Autumnal heat, according to Dr. Hales, at a medium, is 28. 25.

X. MONTH.

Ariſe, ye winds, 'tis now your time to blow,
And aid the work of nature. On your wings
The pregnant ſeeds convey'd ſhall plant a race
Far from their native ſoil.

October

1. Bryony, *black*, 262. Tamus *communis*, F. R.
Elder, *marſh*, 460. 1. Viburnum *opulus*, F. R.
Elder, 461. 1. Sambucus *nigra*, F. R.
Briar, 454. 1. Roſa *canina*, F. R.
Alder, *black*, 465. Rhamnus *frangula*, F. R.
Holly, 466. Ilex *aquifolium*, F. R.
Barberry, 465. Berberis *vulgaris*, F. R.
Nightſhade, *woody*, 265. Solanum *dulcamara*, F. R.

2. Thorn, *black*, 462. 1. Prunus *ſpinoſa*, F. R.

CROW,

October

2. *CROW, ROYSTON, 39.4. Corvus *cornix, returns.*

5. *Catkins of ſallows formed.*

6. *Leaves of aſp almoſt all off—of cheſnut, yellow—of birch, gold-coloured.*
Thermom. 26.50. *Higheſt this month.*

7. BLACK BIRD, 65.1. Turdus *merula, ſings.*
Wind high; rooks ſport and daſh about as in play, and repair their neſts.

9. Spindle tree, 468.1. Euvonymus *Europæus*, F. R.
Some aſh trees quite ſtripped of their leaves.
Leaves of marſh elder of a beautiful red, or rather pink colour.

10. WOOD LARK *ſings.*
§ RING DOVE *cooes.*

14. WOOD LARK *ſings.*
Several plants ſtill in flower, as panſy, white behn, black noneſuch, hawkweed, bugloſs, gentian, ſmall ſtitchwort, &c. in grounds not broken up.
A great miſt and perfect calm; not ſo much as a leaf falls. Spiders webs innumerable appear every where. Wood-lark ſings. Rooks do not ſtir but ſit quietly on their neſt trees.

16. GEESE, WILD, 136.4. Anas, *anſer, leave the fens and go to the rye lands.*

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* Linnæus obſerves in the Syſtema Naturæ, and the Fauna Suecica, that this bird is uſeful to the huſbandman, tho' ill treated by him.

§ Ariſtotle ſays, this bird does not cooe in the winter, unleſs the weather happens to be mild.

October

22. WOODCOCK, 104. Scolopax *ruſticola, returns.*

Some aſh-trees ſtill green.

24. LARK, SKY, 69.1. Alauda *arvenſis, ſings.*

Privet, 465.1. Liguſtrum *vulgare,* F. R.

26. *Thermom. 7. Loweſt this month.*

Honeyſuckle, 458.1,2. *Lomicera periclymen. ſtill in flower in the hedges, and mallow and feverfew.*

WILD GEESE *continue going to the rye lands.*

Now from the north
Of Norumbega, and the Samoeïd ſhore,
Burſting their brazen dungeons, arm'd with ice,
And ſnow, and hail, and ſtormy guſt, and flaw,
Boreas, and Cæcias, and Argeſtes loud,
And Thraſcias rend the woods, and ſeas up-turn.
MILTON.

Here ends the Calendar, being interrupted by my going to London. During the whole time it was kept, the barometer fluctuated between 29.1. and 29.9. except a few days, when it ſunk to 28,6. and roſe to 30 $\frac{1}{2}$.

A SIBIRIAN *or* LAPLAND YEAR.

June
23. Snow melts.
July 1. Snow gone.
9. Fields quite green.
17. Plants at full growth.
25. Plants in full blow.
Auguſt
2. Fruits ripe.
10. Plants ſhed their ſeeds.
18. Snow.

From this time to June 23, ſnow and ice; ſo that by this account, plants, from the coming out of the ground to the ripening of their ſeeds, take but a month. And the ſpring, ſummer and autumn, are crouded into the ſpace of 56 days. This account is taken from a treatiſe publiſhed in the Amæn. Academ. vol. iv. and agrees with one i have ſeen quoted out of Gmelin, who was in Sibiria many years.

THE

CALENDAR of FLORA.

By THEOPHRASTUS.

AT ATHENS, Latitude 37° 25'.

INTRODUCTION.

THE following Calendar was extracted chiefly from Theophraſtus's Hiſtory of plants, and put together in the beſt manner i was able from imperfect materials. Any one who looks into the original, will ſee that accuracy ought not to be expected; the manner of marking the times being often very indeterminate.

I am ſenſible that objections may be made to many parts of this Calendar, but i thought it not worth while to give my reaſons for what I have done, and thereby load a piece of mere curioſity with pompous quotations.

It has always ſeemed extraordinary to me, that when diſciples of Linnæus have been ſent into ſo many parts of the world, in order to make diſcoveries in natural hiſtory, viz. Aſia, Penſylvania, Lapland, Ægypt, Paleſtine, Malabar, Surat, China, Java, Spain, America, Gotland, Italy, Apulia, Surinam, and St. Euſtatia, that Greece ſhould have been overlooked. It is true, Monſieur Tournefort was ſent into the Levant by Lewis the Fourteenth to ſearch for plants, and ſpent ſome years there; it is alſo as true, that he had all the knowledge and zeal neceſſary for ſuch a commiſſion; but the country was too extenſive for one man to examine thoroughly in that ſpace of time. He rambled over moſt of the Greek iſlands, Armenia, and other parts of Aſia; and though he enriched the royal gardens with many new plants, yet ſeveral muſt have eſcaped him for want of time, or a proper ſeaſon.

It were to be wiſhed, therefore, that ſome perſons properly qualified, might be ſent to Greece, and be enjoined to make Attica, particularly, their place of reſidence for a year at leaſt. This might furniſh a Flora and Fauna Attica, that

would be extremely curious to all lovers of natura hiſtory; and tend to clear up many paſſages in thoſe authors, who firſt opened that branch of knowledge, as well as carried ſome parts of it much farther, than is generally known, or at leaſt acknowledged; and from whoſe writings much more benefit might ſtill be reaped, were they better underſtood, eſpecially in the medicinal way.

As the Engliſh nation will have the honour of firſt making known to the world the true and accurate proportions of the ancient Greek architecture, ſo i hope it is reſerved for us to bring the reſt of Europe thoroughly acquainted with the nature of the ſoil, climate, productions, animals, &c. of a country whoſe ancient glory ſo much reſembles our own, and in a great meaſure has been the cauſe of it, by furniſhing us with the beſt models of good ſenſe, taſte, and juſt ſentiments in every branch of human knowledge: We therefore ought in a particular manner to look upon Attica, from whence, as Cicero ſays, *Humanitas, doctrina, fruges, jura, leges ortæ, atque in omnes terras diſtributa putantur*, with the veneration due to a mother country. Should ſuch a ſcheme take place, i could name a perſon, perfectly well qualified, by his youth and abilities, and zealouſly inclined upon proper encouragement to be one of the party. France, Sweden *, and Ruſſia have ſet us examples of this kind, and why this great and flouriſhing nation ſhould not follow them, i cannot ſee. We have had our ſhare in advancing natural hiſtory, it is true, but hitherto without any public encouragement.

* Amongſt many inſtances of this ſort, there is one that deſerves particular notice mentioned Amæn. Academ. p. 445. the author ſays, that Haſſelquiſt was ſent into Ægypt at the expence of his countrymen the Eaſt Gothlanders, of the heads of the univerſity, and of the Eaſt India company, for the ſtudy of natural hiſtory; and ſtaid above a year at Cairo.

THE
CALENDAR of FLORA.
By THEOPHRASTUS.

Feb.

1. —* Violet, *early bulbous*, 1144. H. Leucoium *vernum*, λευκοιον, F.
   Wall flower, 291.2. Cheiranthus, *cheiri*, φλογιον, F.
   Cornel tree, 1536, H. Cornus, *mas*, κρανεια, L.
   Dogberry, 460. Cornus, *ſanguinea*, θηλυκρανεια, L.

14. — Bay tree, 1688. H. Laurus *nobilis*, δαφνη, L.
   Alder, 442. Betula *alnus*, κλήθρα, L.
   Abele, 446.3. Populus *alba*, λευκη, L.
   Elm, 468. Ulmus *campeſtris*, πτελεα, L.
   Sallow, Salix, ἰτεα L.
   Poplar, *black*, 446.1. Populus *nigra*, αιγειρος, L.
   Plane tree, 1706. H. Platanus *orient.* πλατανος, L.

* This mark — after ſome of the figures, denotes that the time is only determined within certain limits.
All the other marks mean the ſame as in my own Calendar.

March

12 — * Beginning of SPRING.

Fig tree, 1431. H. Ficus *carica*, ερινεος, L.

Alaternus, 1608.1. Rhamnus *alatern.* φιλυκη, L.

Hawthorn, 453.3. Cratægus *oxyacanth.* οξυακανθος, L.

Chriſt's thorn, 1708. H. Rhamnus *paliurus*, παλιουρος, L.

Turpentine tree, 1577. H. Piſtacia *terebin.* τερμινθος, L.

Cheſnut-tree, 1382. H. Fagus *caſtanea*, διος βαλανος, L.

Walnut-tree, 1376. H. Juglans *regia*, καρυα, L.

Lilly of the valley, 264. Convallaria *Maialis*, ονανθη, F.

Narciſſus, C. B. 49. ανεμωνη λειμωνια, F.

Daffodil, 1131. H. Narciſſus *pſeudo narc.* βυλβοκωδιον, F.

Corn flag, 1169.2. H. Gladiolus *communis*, F.

Hyacinth, 1162.31. Hyacinthus *comoſus*, υακινθος, F.

Roſe, roſa, ροδον, F.

20. † Elder tree, 461.1. Sambucus *nigra*, αχλη, L.

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* Between February 28 and March 12, the Ornithian winds blow, and SWALLOW appears.

† Between March 11 and 26, the *kite* and *nightingale* appear, that is in the leafing ſeaſon. The appearance of the hawk is conſonant to what Ariſtotle ſays, as quoted in the preface, but is determined upon a different kind of teſtimony; which is a proof that this part of the Calendar at leaſt is tolerably well ſtated.

March

20. Fleawort, 881. H. Plantago *pſyllium*, κυνοψ, F.
Oak, 442. Quercus, robur, δρυς, L.
Fig-tree, 1431. H. Ficus *carica*, συκη, L.
Oak, 1386, H. Quercus, *eſculus*, φηγος, L.
Lime-tree, 473. Tilia *Europæa*, φιλυρα, L.
Maple, 470.2. Acer *campeſtris*, ζυγια, L.
Apple-tree, 451. Pyrus *malus*, μηλεα, L.
Ivy, 459. Hedera *helix*, ιψος, L.
Beam tree, *white*, 453. Cratægus *aria*, αρια, L.

26. Tree of life, 1498. H. Thuia *occident.* θυεια, L.

April

4.— Succory, 172. Cichorium *intybus*, χιχορειον, F.

May 12. Beginning of SUMMER.

15 — *Wheat harveſt.*
Turpentine tree, 1557. H. Piſtacia *terebin*, τερμινθος, F. R.
Flower of Conſtantinople, 992.1. H. Lychnis *Chalced.* λυχνις, F.
Roſe campion, 993.2. H. Lychnis *coronar.* διος ανθος, F.
Aſphodel, *yellow*, 1192.4. H. Aſphodelus *luteus*, αμαραχος, F.
Aſh-tree, 468. Fraxinus *excelſior*, μελια, F. R.
Maple, 470.2. Acer *pſeudo-platanus*, σφενδαμνος, F. R.
Pine, 1398. H. Pinus *ſylveſtris*, πιτυς, F.
Fir-tree, *common*, 1396.2. Pinus *abies*, πευκη, F.

June

20 — * Fir-tree, *yew leaved*, 1394. Pinus *picea*, ελατη, F.

Yew-tree, 445. Taxus *baccata*, μιλος, F. R.

Cornel-tree, 1536. H. Cornus *mas*, κρανεια, F. R.

Midſummer ſhoots of the oak.

The fig, the vine, and the pomegranate, ſhoot later.

July

23. *Cuckow diſappears.*

30. *Eteſian winds blow.*

* Botaniſts doubt which of theſe two firs is the πευκη and which the πιτυς. Theophraſtus ſays expreſsly that the πευκη flowers ſome days before the πιτυς, and therefore this queſtion might be probably decided.

Auguſt

19 — Beginning of AUTUMN.

Lilly, Lilium, λειριον, F.

Crocus, 1173.3. Crocus *autumnal.* κροκος, F.

Dogberry 460. Cornus *ſanguinea* Σπλυκρανεια, F. R.

Alder, 442. Betula *alnus*, κλημβρα, F. R.

Quail, 58.6. Tetrao, *coturnix*, ορτυξ, *departs.*

Sept.

20 — Crane, 95. Ardea, *grus*, γερανος, *departs.*

Autumn ſhoots of trees.

October

12 — Oak, 440. Quercus, *robur*, δρυς, F. R.

Cheſnut

October

12 — Cheſnut, 1382. H. Fagus, *caſtanea*, διος βαλανος, F. R.
Chriſt's thorn, 1708. H. Rhamnus *paliur.* παλιθρος, F. R.
Hawthorn, 453.3. Cratægus *oxyacantha*, οξυακανθος, F. R.
Holm oak, 1391. H. Quercus *coccifer*, πρινος, F. R.
Alaternus, 1608.1. H. Rhamnus *alatern.* φιλυκη, F. R.

29 — Venice ſumach, 1696. H. Rhus *cotinus*, κοκκομηλεα, F.
Apple-tree, 451. Pyrus *malus*, μηλεα, F. R.
Beam-tree, *white*, 453. Cratægus *aria*, αρια, F. R.
Lime-tree, 473. Tilia *Europæa*, φιλυρη, F. R.
Box-tree, 445. Buxus *ſempervivens*, πυξος, F. R.

Beginning of WINTER.

Novem.

15 — Ivy, 459. Hedera *helix*, κιτ̃ος, F. R.
Juniper, 444. H. Juniperus *communis*, αρκευθος, F. R.
Tree of life, 1408. H. Thuia *occident.* θυεια, F. R.
Yew-tree, 445. Taxus *baccata*, μιλος F. R.
Pear-tree, 1450. Pyrus *communis*, αχρας, F. R.
Arbutus, 1577. 2. H. ανδραχνη, F. R.

INDEX.

☞ The large Roman Numerals refer to the Months of both Calendars; the ſmall Numerals to the Days of the Month of the Swediſh; the common Figures to the Engliſh.

A.

ACER, IV. 6. 13. 18. 25. V. 2.
Achellea, VI. xxiii. xxix. VII. vi. vii. VI. 18.
Actæa, VI. vii.
Adonis, VI. xiii. ix. i.
Adoxa, V. viii.
Aegopodium, VI. 6.
Aeſculus, V. xvi. IV. 1. V. 12.
Agrimonia, VII. vi. IV. 24. V. 17.
Agroſtema, VII. v. VI. 13.
Ajuga, V. xxx. IV. 29.
Alauda, III. xx. II. 4. IX. 25. X. 10. 14. 24.
Alchemilla, V. xxv.
Aliſma, VII. 28.
Allium, V. 6. VIII. 5.
Allopeurus, VI. iv.
Alnus, III. 26.
Alſine, I. 26.
Amaranthus, VII. 24.
Amygdalus, IV. 6.
Anagallis, VI. 2.
Anas, IV. vii. II. 12. X. 16. 26.
Anemone, IV. xvi. V. iii. IV. 10. V. 20.
Anethum, VII. 9.
Angelica, VII. 9.
Anthemis, VI. xxiii. xxix. VI. 2.
Anthericum, VI. ii.
Anthyllis, VI. xii.
Anthoxanthum, VI. 7.
Antirrhinum, VI. xxviii.
Apis, III. 2. IV. 10.
Apium, VII. 10. VIII. 29.
Aquifolium, IV. 3.
Aquilegia, VI. vii. V. 25.
Arctium, VII. ix. VII. 28.
Ardea, IV. 14.
Artemiſia, VII. x. VIII. xiv. IX. vi. IV. 9. V. 1. VII. 16. VIII. 9.
Arum, IV. 26.
Aſparagus, VII. 16.
Aſperula, V. 8.
Atriplex, IX. xxii.
Atropa, VI. xviii. IV. 18. V. 21.
Aſarum, V. iii.
Aſtragalus, VI. xxiv.
Avena, VI. 28. VIII. 2.

B.

Ballota, VII. x.
Bellis, I. 26.
Berberis, V. xiii. VI. viii. V. 12. X. 1.
Betonica, V. v.
Betula, V. xiii. xiv. IV. 1. 7. 27.
Bidens, VII. 18.
Braſſica, IV. 15.
Briza, VI. xviii.
Bryonia, VI. xxviii. IV. 27. VI. 6.
Bunium, V. 20.

C.

Caltha, V. xxi. IV. 16.
Campanula, VI. xi. xvi. xxix. VII. i. ii. vi. VII. 11.
Cannabis, VII. ix.
Caprimulgus, V. 5. VIII. 15.
Cardamine, V. xxviii. IV. 18. V. 20.
Carduus, VI. xxii. VII. ix. xvii. VIII. 12.
Carpinus, V. xvi. III. 29. IV. 10. 13. 25.
Caſtanea, IV. 16.
Centaurea, VI. xxii. xxiv. VII. i. vi. xxii. VI. 28. VII. 13.
Chærophillum, V. xxv. VII. vii. IV. 25. 29. V. 28. VI. 5.
Charadrius, VIII. 14.
Cheiranthus, IV. 21.
Chelidonium, V. xxvii. V. 5. 10.
Chenopodium, IV. 24. VI. 21. VIII. 17.
Chryſanthemum, VI. xvii. xxix. VI. 23.
Chryſoplenium, V. iii.

Cichorium

INDEX.

Cichorium. VII. xii. VI. 28.
Ciconia, V. ix.
Circæa, VII. x. VII. iv.
Ciſtus, VI. xx.
Clematis, IX. vi, IX. 2.
Clinopodium, VII. x.
Cochlearia, III. 31. VI. 5.
Colchicum, VII. xviii. VIII. xxviii.
Columba, III. 5. VII. 30. X. 10.
Comarum, VI. xx. VI. 12.
Conium, VI. 16.
Convallaria, V. xxx. V. 3. 10.
Convolvulus, VII. i. iv. IV. 25. VII. 27.
Conyza, VII. xxiii.
Cornus, V. xxx.
Corvus, II. 12. III. 2. VIII. 17. X. 2.
Corylus, IV. xii. V. ix. I. 23. II. 22. IV. 7.
Cratægus, V. xv. VI. xii. xvii. III. 29. IV. 28. V. 10.
Crepis, VI. xxix.
Crocus, IV. xiii.
Cucubalus, VIII. i.
Cuculus, V. xii. IV. 17.
Cygnus, IV. x.
Cynogloſſum, IV. 10. V. 4.
Cyprinus, V. xxv. xxx.
Cytiſus, IV. xiii.

D.

Dactylis, VII. xxii.
Daphne, IV. xiii. IV. 16.
Daucus, VII. vi. VII. 2.
Delphinium, VI. 23.
Dianthus, VI. xxiv. xxix. VII. viii. VII. 7.
Dies Chalybeati, II. xxii.
Digitalis, VII. iv.
Dipſacus, VII. xviii. xx. VIII. 29.
Draba, IV. xv.
Droſera, VII. x.

E.

Echium, VI. 6.
Elymus, VI. xxviii.
Empetrum, IV. xxx.
Epilobium, VI. xxiv. xxvi. VII. xii. xv. VI. 13. VII. 28.
Erica, VI. xxix. VI. 9.
Eriophorum, V. xxx.
Eryſimum, V. xxv. IV. 10. 16. V. 16.
Eſox, IV. x.
Euonymus, V. xiv. X. 9.
Eupatorium, VII. xv.
Euphorbia, IV. 25.
Euphraſia, VI. xvii. VI. 9. VII. 6.

F.

Fagus, V. xvi. IV. 18. 21. V. 9. VII. 2.
Ficus, IX. iv. IV. 16. 21. 28. VII. 11.
Filipendula, VI. xxii.
Fragaria, VI. xxvi. IV. 13. VII. 9.
Frankenia, VII. ix.
Fraxinus, V. xxi. IV. 18. 22. V. 6.
Fringilla, II. 16. IX. 16.

G.

Galanthus, IV. xiii. I. 26.
Galeopſis, VI. 25.
Galium, VI. xvi. VII. vi. IV. 3. V. 13. VII. 8. VIII. 1.
Geniſta, IV. 22.
Gentiana, VI. xxii. VII. 26. VII. 2.
Geranium, V. xxvi. xxx. VI. v. ix. xi. xiv. IV. 23. 27. V. 15.
Geum, VI. ii. xiii. V. 1. 28.
Glechoma, V. xxvi. IV. 16.
Gnaphalium, V. xxvi.

H.

Hedera, VIII. 9. IX. 11.
Helenium, VII. 24.
Helleborus, IV. xxi.
Hemerocallis, VI. xx. VII. vii. xvi.
Heracleum, VII. i. III. 28. IV. 29. VI. 3. 13.
Herniaria, VI. xxix.
Heſperis, VI. vii.
Hieracium, VII. xvi.
Hippophae, V. xiv.
Hirundo, V. ix. IV. 6. IX. 21.
Holcus, VII. v.
Hordeum, V. xiii. V. 6. VIII. 3.
Hottonia, V. 3.
Humulus, VII. vi. IV. 14. IX. 20.
Hyacinthus, IV. 26.
Hybernacula, V. viii.
Hydrocotyle, VI. xxvii.
Hyoſcyamus, VI. xii. V. 26.

Hypericum,

INDEX.

Hypericum, VI. xxix. VII. vi. xii. IV. 27. VI. 21.
Hypochæris, VI. xxvii.
Hyſſopus, VII. 11.

I.

Jaſminus, IV. 28. VII. 11.
Ilex, I. 23. IV. 24. 26. X. 1.
Impatiens. VII. xviii.
Inula, VII. xiii. xxiv. IX. xvii.
Iris, VI. x. VII. vi. VI. 2.
Iſatis, VI. xxix.
Juglans, IV. xiv. xviii. V. 15.
Juniperus, VI. iii. IV. 28.

L.

Lamium, I. 23. V. 6. VI. 16.
Lapſana, VI. 15.
Lathyrus, VI. xvii. xxix.
Lavandula, VII. vi.
Laurus, III. 11. IV. 10. 29. V. 1.
Leontodon, VI. vii. IV. 3. 10. VIII. 21.
Leonorus, VII. vii.
Lepidium, V. iii. VII. xiii.
Leucoium, IV. xiii.
Libellula, V. xxi.
Liguſticum, VII. vii.
Liguſtrum, V. xiv. X. 24.
Lilium, VI. xviii. VII. xx. VII. 10. 11.
Linum, VI. vii. xxiv. VII. 18.
Liriodendron, IV. 16. V. 4.
Lithoſpermum, VII. 6.
Lonicera, IV. xv. VII. xii. I. 11. 23. VI. 15. X. 26.
Lotus, VI. vii.
Lychnis, V. xxx. VI. xiv. xvii. IV. 22. V. 26. 30.
Lycopodium, IV. 1.
Lycopſis, VIII. xii.
Lycopus, VIII. xii.
Lyſimachia, VI. xxii. VII. iv. V. 25. IX. 2.
Lythrum, VII. ii. VII. 18.

M.

Malva, VII. xii. IV. 13. VI. 6. 15. VIII. 15. X. 26.
Marrubium, VIII. 7.
Matricaria, VI. xi. IV. 10. VI. 25. X. 26.
Medicago, VI. xxvii.
Meleagris, IV. xv.
Melica, VI. vii.
Meliſſa, VII. xxvi.
Mentha, VII. xv. VII. 22. 28. VIII. 7. 9.
Menyanthes, VI. xiii. IV. 22.
Mercurialis, V. 1. IV. 22.
Meſpilus, IV. 22. VI. 5.
Mirabilis, VII. xvi.
Morus, IX. i. IV. 22. 28. V. 14. 20.
Motacilla, IV. xiii. V. iii. xv. II. 12. IV. 9. 16. 28. VIII. 26.
Myoſotis, V. 13.
Myrica, V. xiv. VIII. 26.

N.

Narciſſus. V. xv. IV. 1.
Noctes, V. xxiv. VI. 20.
Nymphæa, IV. xvii. VI. xiv. xvi. VI. 2.

O.

Oenothera, VII. v.
Ononis, VII. vi. VII. 11.
Ophrys, VI. xxii. V. 5.
Origanum, VII. x.
Orchis, VI. vii. xiv. xv. VI. 12.
Ornithogalum, IV. xv.
Orobus, V. xiii.
Oſmunda, VI. xxiv.
Oxalis, V. xiii. IV. 16.

P.

Pæonia, VI. ii. xvi.
Papaver, VI. xxiv. VII. vii. VI. 7. 22.
Papilio, IV. vii.
Parietaria, V. xxiii.
Paris, VI. vii.
Parnaſſia, VI. xvi. IX. 5.
Paſtinaca, VI. 22.
Pavo, VI. xxix.
Perdix, VII, 18.
Phaſeolus, VII. 10.
Phellandrium, VI. 17.
Philadelphus, V. xiv. VI. xxiv.
Phyllerea, IV. 22.
Picris, VII. xii.
Pimpinella, VI. xviii. VII. 28.
Pinguicula, V. xxx.
Pinus, VI. i. III. 29. IV. 17. 18. 21. 22. 25. 29. V. 7. VI. 16.

INDEX.

Piſum, IV. 29. VIII. 21.
Plantago, V. xxviii. VI. v. IV. 26. VII. 2.
Platanus, IV. 14. 18.
Polygala, V. xxv. V. 15.
Polygonum, VI. 3. 7. VI. 8. VII. 13. 20.
Populus, XII. xxiii. IV. xix. xxx. V. ix. xvi. xx. III. 21. IV. 16. 17. 21. 25. V. 14.
Potentilla, V. xvi. VI. xi. xiv. xvi. xviii. V. 26. VII. 4.
Prenanthes, VII. x.
Primula, V. i. xiv. xv. III. 29. IV. 9. V. 4.
Prunella, VI. xxii. VI. 21.
Prunus, V. ix. xv. xxv. xxviii. III. 11. 29. IV. 1. 6. 13. 16. 18. IX. 20. X. ii.
Pteris, VIII. xxviii. IX. 20.
Pyrus, V. xv. xxvi. VI. ii. IV. 4. 6. 10. 14. 18. 23. V. 13.

Q.

Quercus, V. xxi. IV. 7. 18. V. 6.

R.

Rallus, IV. x.
Rana, IV. xiii.
Ranunculus, IV. xv. V. xxvi. VI. vii. xvii. VII. vi. III. 28. IV. 28. V. 14.
Reſeda, VI. 25.
Rhamnus, V. xv. xxi. VI. xv. xvi. IV. 11. V. 31, X. 1.
Rheum, VI. xvi.
Rhinanthus, V. 4.
Ribes. V. xxv. VI. vii. II. 25. III. 2. IV. 3. 6. 13.
Robinia, V. xv. IV. 12. 21. VI. 17.
Roſa, V. xv. VI. xv. VII. vii. xxiv. IV. 4. V. 11. VI. 6. X. 1.
Roſmarinus, I. 5. IV. 22. VI. 24.
Rubus, V. vii. xxvii. VI. vii. xxiv. IV. 3. 28. V. 24. VI. 5. 6. VII. 11. 22. VIII. 30.
Ruta, VIII. 1.

S.

Sagina, VII. 2.
Salix, III. xix. IV. xxi. V. vii. xiii. xvi. III. 11. IV. 1. 7. 10. 17.
Salmo, V. xxi.
Salvia, VI. 13. VIII. 14.
Sambucus, VI. xxix. VII. xvii. II. 4. IV. 25. VI. 6. X. 1.
Sanguiſorba, VII. vii.
Sanicula, VI. 8.
Saponaria, VII. xxii. VIII. 1.
Satyrium, VI. xx.
Saxifraga, V. xxvi. V. 6.
Scabioſa, VI. xxix. VIII. iv. VI. 12. VII. 28.
Scolopax, X. 22.
Scrophularia, VII. x. IV. 27. VI. 13.
Scutellaria, VI. xxvi.
Secale, V. xxv. VI. xviii. VIII. iv. V. 21. VI. 21.
Sedum, VI. xx. VII. vi. xiv. xv. VIII. 1. IV. 4. VII. 13. 22. VIII. 7.
Semina, V. viii. xiii.
Senecio, VI. vii. IV. 12. VIII. 26.
Serapias, VII. ii.
Serpentes, IV. vi.
Serratula, VII. xv. xxvii.
Silene, VI. 13. 28.
Siſymbrium, IV. 14. V. 30. VI. 6. VIII. 1.
Sitta, VIII. 8.
Solanum, VI. xxiv. VI. 16. VII. 11. 30. X. 1.
Solidago, V. xxiv.
Sonchus, VII. xi. xxi. VII. 28.
Sorbus, VI. iii. IV. 1. 13. V. 6. VI. 3. IX. 20.
Spartium, IV. 18. 22. 23. VI. 9.
Spergula, I. 26. V. 31.
Spinacia, VII. 8.
Spiræa, VII. v. IV. 22. VI. 12. 27. VII. 11.
Stachys, VI. xxv. VII. ix. VI. 9. 22.
Stellaria, IV. 22. V. 20. VI. 6.
Sturnus, V. vii.
Syringa, V. xiv. VI. xviii. xxv. IV. 9. 27.

T.

Tamus, V. 20. 30. X. 1.
Tanacetum, VII. xv. III. 29. VII. 8. VIII. 5.

Tegmenta,

INDEX.

Tegmenta, IV. xi.
Tetrao, II. 22.
Teucrium, VII. x. VII. 8.
Thymus, VI. 3.
Tilia, V. xxi. VII. xi. IV. 12. 18. V. 15. VII. 13.
Tinunculus, IV. xiii.
Thalictrum, VII. 2.
Tipula, IV. vi.
Tordylium, VI. xxvii. VI. 21. VII. 6.
Tormentilla, VI. ii. IV. 22. V. 5.
Trifolium, VII. x. V. 27. VIII. 1.
Tringa, IV. vi.
Triticum, IV. 3. VI. 12. 21. 25. VII. 2. 13. VIII. 21.
Trollius, V. xxvi.
Tulipa, V. xxv.
Turdus, II. 16. III. 4. IV. 23. IX. 25. X. 7.
Tuſſilago, IV. xii. xxx.

V.

Vaccinium, V. xxx. VI. vii. xxix.
Valantia, V. 1.
Valeriana, VI. xvii. V. 4. VI. 11.
Vaporaria, IV. xix.
Verbaſcum, VII. i. ii. VI. 22. VII. 11.
Verbena, VI. 17.
Veronica, V. xxx. VII. v. III. 26. IV. 26. V. 30.
Viburnum, V. xiv. VI. xiv. I. 23. III. 11. 29. IV. 4. 21. 16. VI. 2. VII. 22. X. 1.
Vicia, VI. xxii. xxiv.
Viola, V. iii. III. 28. IV. 18. V. 20.
Vipera, VIII. 7.
Vitis, IV. 15. VI. 6. 25.
Ulex, IV. 24. VII. 6. IX. 16.
Ulmus, V. viii. xv. IV. 1. 10. 12.
Urtica, IV. 25. VIII. 7.

INDEX.

A.

Abele, IV. xix. IV. 16. 17.
Acacia, V. xv. IV. 12. 21. VI. 17.
Adonis, VI. xiii. IX. i.
Agrimony, VII. vi. xv. VI. 24. VI. 17. VII. 18.
Alder, V. xiv. xxi. VI. xvi. III. 26. IV. 7. 11. V. 31. IX. 16. X. 1.
Ameranth, VII. 24.
Anemone, V. iii. IV. 10. V. 20.
Apple tree, V. xv. VI. ii. IV. 4. 14. 23.
Apricot, IV. 1. 6. 16. 22.
Archangel, I. 2. 3. VI. 16. 25.
Arſmart, VI. 3. VII. 20.
Aſh, V. xxi. IV. 18. 22. V. 6. 20. IX. 20. 22.
Aſp, XII. xxiii. IV. xix. V. xx. III. 21. IV. 25. V. 14. X. 1. 22.
Aſparagus, VII. 16.
Aſphodel, VII. ii.
Aſſarabacca, VI. ii. xiii.
Avens, VI. ii. xiii. V. 28.

B.

Barberry, V. xiii. VI. viii. IV. 12. X. 1.
Barley, IV. xvi. V. xiii. VII. vii. VIII. xvi. V. 6. VI. 28. VIII. 3.
Baſil, VII. x.
Bay, III. 11. V. 1. IX. 10. 29.
Beam tree, VI. xv.
Bean, IV. 29. VII. 20.
Bees, III. 11. IV. 10.
Bedſtraw, VII. vi. VII. 8. VIII. 1.
Beech, V. xvi. IV. 21. VII. 2.
Bellflower, VI. xi. VII. 11.
Betony, VII. x. IV. 27. V. 5. VI. 13. VII. 4.
Bilberry, VI. vii. xxix. VII. viii.
Bindweed, VII. i. iv. IV. 25. VI. 25. VII. 27.
Birch, V. xiii. IV. 1. 27. IX. 11.
Birds, VIII. iv.
Bittern, IV. 4.
Black cap, IV. 28.
Blackbird, IX. 27. X. 7.
Bluebottle, VI. xxii. VI. 28.
Bramble, V. vii. VI. vii. IV. 3. V. 24. VI. 5. VII. 22. IX. 11. 30.
Braſs nights, VI. xxi.
Bream, V. xxx.
Briar, VI. xv. VII. vii. IV. 4. X. 1.
Brooklime, V. 30.
Broom, IV. 18. 22. 23. VI. 9.
Bryony, VI. xxviii. IV. 27. V. 20. 30. X. 1.
Buckbean, IV. 22.
Buckwheat, VI. 7.
Bugle, V. xxx. IV. 29.
Bugloſs, V. 12. VI. 6.
Bur, IV. xxx.
Burdock, VII. ix. VII. 28. VIII. 12.
Burnet, VII. vii.
Buttercups, VI. 14.
Butterfly, IV. vii.
Butterwort, V. xxx.

C.

Camomile, VI. xi.
Campion, VI. xiv. xxviii. IV. 22. V. 27.
Carrot, VII. vi. VII. ii.
Catchfly, V. xxx. VI. xiii.
Cats foot, V. ix. xxvii.
Cedar, IV. 17.
Celandine, V. xxvii. V. 5. 10.
Chaffinch, II. 16. IX. 16.
Cherry tree, V. xv. xxv. xxviii. III. 29. IV. 8.
Chervil, VII. vii. V. 28. VI. 5.
Cheſnut, V. xvi. IV. 1. 16. 18. V. 9. 12. X. 6.
Chickweed, VIII. i. I. 26.
Chriſtopher herb, VI. vii.
Cicely, V. xxv. IV. 25.
Cinquefoil, V. xvi. VI. xi. xiv. xviii. xx. VI. 12.
Ciſtus, VI. xx.
Clary, VIII. 14.
Cleavers, IV. 3. V. 13.

Clover,

INDEX.

Peach, IV. 6. 16.
Peacock, VI. xxix.
Pear, V. xxvi. IV. 6. 18.
Pearlwort, VII. 2.
Peaſe, V. xxviii. VI. xxix. IV. 29. VIII. 21.
Peiony, VI. i. xvi.
Pellitory, V. 23.
Pennyroyal, VII. 22.
Pennywort, VI. 27.
Pepper, wall, VI. xx. VII. xv.
Phyllerea, IV. 22.
Pike, IV. x.
Pilewort, IV. xv. III. 28.
Pimpernel, VI. 2.
Pine, VII. x.
Pink, VI. xvii. xxix. VII. viii. VII. 7.
Plantain, V. xxviii. VI. v. IV. 26. VII. 1. 24.
Plane tree, IV. 14. 21.
Plumb tree, V. xxviii. IV. 6. 16.
Polyanthus, V. i.
Pondweed, VI. viii.
Poplar, IV. xxx. V. xvi. IV. 21. 22.
Poppy, VI. xxiv. VII. vii. VI. 7. 22.
Potatoe, VII. xi.
Primroſe, V. xv. VII. v. III. 29.
Privet, V. xiv. X. 24.

Q.

Quicken tree, VI. iii. IV. i. xiii. V. vi. VI. iii.
Quince, IV. 10. 28. V. 13.

R.

Radiſh, VI. 3.
Ragweed, IV. 12.
Rampions, VI. xvi. VII. i.
Ramſons, V. 6.
Raſberry, IV. 13. 28. VI. 6. 24. VII. 11.
Rattle VII. vii. V. 4.
Redſtart, IV. 16.
Reſt harrow, VII. vi. VII. 11.
Rhapontic, VI. xvi.
Robert herb, VI. xiv. IV. 23.
Robin, VIII. 26.
Roche, V. xxv.
Rocket, VI. 25.
Rook, II. 12. III. 2. VI. 21. VIII. 12. 17. X. 7.
Roſe, V. xv. VI. xv. VII. vii. VIII. vii. V. 11. VI. 6.
Roſemary, I. 5. IV. 22. VI. 24.
Rue, VII. iii. VIII. 1.
Rupture wort, V. xxix.
Ruſh, V. xxx.
Rye, V. xxv. VI. xviii. VIII. iv. V. 21. VI. 21.

S.

Saffron, IV. xii. VII. xviii. VIII. xxviii.
Sage, VII. viii.
Saint John's wort, VI. xxix. VII. vi. xii. IV. 27. VI. 22.
Sallow, III. xix. V. xvi. X. xxviii. III. xi. IV. 6. 7. X. 5.
Salmon, V. xxi. xxviii.
Sampire, IX. xvii.
Sanicle, VI. 8.
Saw-wort, VII. xv.
Saxifrage, V. iii. xxvi. VI. xviii. V. 6. VI. 9. VII. 28.
Scabius, VI. xxix. VI. 22.
Seeds, IX. xiv.
Self heal, VI. xxii. VI. 21.
Serpents, IV. vi.
Sheep, V. iii.
Shoots, VI. 28. VII. 11.
Silverweed, VII. 4.
Smallage, VIII. 29.
Smelt, IV. xxi.
Sneezewort, VI. xxix. VII. vii.
Snow, V. xviii. IV. 29.
Snowdrops, IV. xii. I. 26.
Soapwort, VII. xxii. VIII. 2.
Solomon's ſeal, V. 10.
Sorrel, V. xiii. IV. 16.
Sowing, V. viii. xiii.
Spearwort, VI. xvii. VII. 6.
Speedwell, VII. v. III. 26.
Spider, IV. vi.
Spikenard, VII. xxiii.
Spindle tree, V. xiv. X. 9.
Spurge, IV. xxv.
Spurrey, I. 26. V. 31.
Star of Bethlehem, IV. xv.
Starling, V. vii.
Steel nights, II. xxii.

Stitchwort, IV. 22. V. 20. VII. 6.
Stonecrop, VII. vi. xiv. VII. 13.
Strawberry, VI. xxvi. IV. 13. VII. 9.
Succory, VII. xii. VI. 28.
Sundew, VII. x.
Swallow, V. ix. IX. xvii. IV. 6. IX. 21.
Swan, V. ix. IX. xvii.
Sycomore, IV. 13. 25.

T.

Tanſey, VI. xvi. VII. xv. III. 29. V. 26. VII. 8. VIII. 5.
Tare, VI. 6.
Teaſel, VII. xviii. VII. 29.
Thermometer, II. 20. 25. 26. III. 2. 28. IV. 20. 29. V. 4. 30. VI. 19. 25. VII. 8. 15. VIII. 8. 16. IX. 10. 16. X. 6.
Thiſtle, VI. xxii. VII. ix. x. xi. xvii. xxi. xxvii. VII. 29. VIII. 12.
Thorn, V. iv. xv. xxviii. VI. xv. xvii. III. 29. IV. 18. 22, 28. V. 10. VI. 5. X. 2.
Throatwort, VI. xxix. VII. ii. vi.
Thyme, VI. 3.
Thruſh, II. 16. III. 4. IX. 29.
Toad flax, VI. xxviii.
Tormentil, VI. ii. IV. 22. V. 5.
Touch me not, VII. xviii.
Travellers joy, IX. 2.
Trefoil, VI. vii.
Tulip, V. xxv.
Tulip tree, IV. 16. V. 4.
Turkey, IV. xv. V. 15.
Turneps, IV. 15.
Tway blade, VI. xxvi. V. 5.

V.

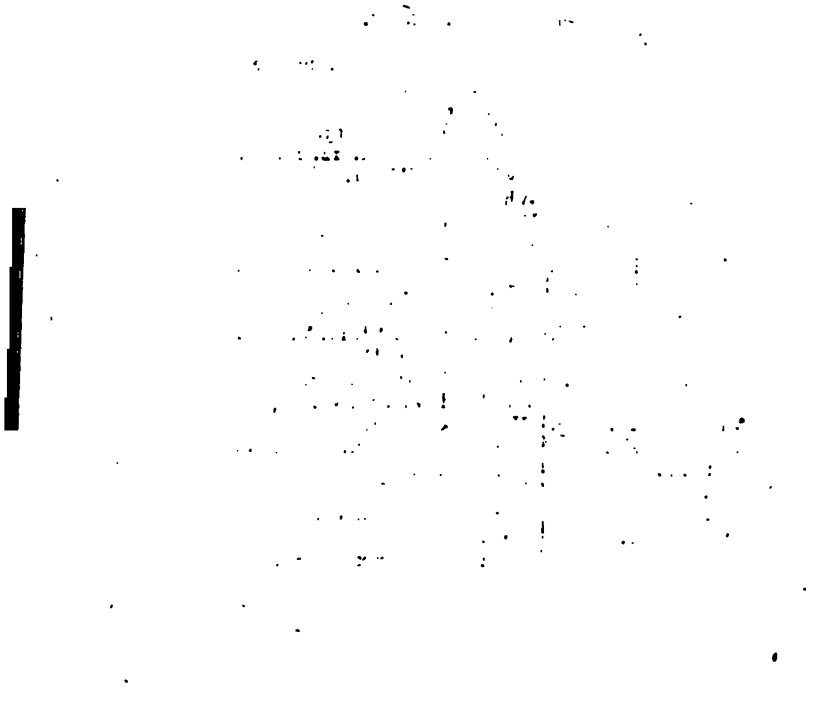
Valerian, VI. xvii. V. 4. VI. 12.
Vervain, VI. 17.
Vetch, VI. xii. xvii. xxii. xxiv.
Vine, IV. 15. VI. 6. 25.
Violet, IV. xii. V. iii. vii. VII. xxvi. III. 28. IV. 18. V. 3. 20. VII. 2.
Viper, VIII. xxix.

W.

Wagtail, IV. xii. V. iii. IX. xvii. II. 12.
Wallflower, IV. 2.
Wallnut, IV. 14. V. 15.
Wheat, IV. 3. VI. 12. 21. 25. VII. 11. VIII. 21.
Wheat ear, V. iii.
Whorts, V. iii.
William, ſweet, V. xxiv.
Willow, IV. xxi. IV. 1. 7. 10. 17. VII. 11.
Willow herb, VI. xxii. xxiv. xxvi. VII. i. ii. xii. VI. 13. VII. 18. 28. VIII. 21. IX. 2.
Woad, VI. xxix. VI. 25.
Woodbind, VII. 12. VI. 15.
Woodcock, X. 22.
Wormwood, VIII. xiv. IX. vi. IV. 9. VIII. 9.

Y.

Yarrow, VI. xxiii. VII. vi. VI. 18.
Yew tree, III. xxix. IV. 24.



THE SWEDISH PAN.

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BY

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§. 1.

THE antients attributed the paſtoral life to *Pan*, the care of flowers to *Flora*, hunting to *Diana*, and the cultivation of grain to *Ceres*. We, tho' acknowledging only one Deity, who governs all things, yet often uſe theſe names to denote the ſubject we undertake to treat upon. What word is now more known among botaniſts than the word *Flora*; by which they mean all thoſe plants, which grow within a certain compaſs of ground; as our Fauna Suecica

takes in all thoſe animals, which are natives of Sweden? For a like reaſon we have entitled this ſmall tract the *Swediſh Pan*; intending thereby to denote the five domeſtic quadrupeds, which live upon plants growing in Sweden; or the devouring army of *Pan*, which lays waſte the provinces of the *Swediſh Flora*. We chooſe by this means to avoid a prolix definition, which is always diſagreeable for the title of a book.

§. 2.

The paſtoral life, by the teſtimony of both ſacred, and prophane hiſtory, is nearly as old as man himſelf; ſo that i would willingly derive the knowledge which i am going to deliver, from the moſt ancient times. But altho' plants have been conſtantly obvious to the eyes of every man; yet i am obliged to declare, that we have nothing delivered down to us in any book concerning the kinds of plants proper for the different kinds of cattle; ſo that i may be ſure of not diſguſting my reader with ſtale matter new dreſſed up. For the whole of what i preſent to him is new.—Our illuſtrious preſident in his journey thro' Dalecarlia ann. 1734, made the firſt attempt this way, as may be ſeen Flor.

Lapp. p. 158. where he ſays thus. 'In my 'journey thro' Dalecarlia, when we had climbed 'up the mountains, and were got into Norway, 'my fellow travellers being tired, and aſleep, 'i wandered about in a diſmal wood, and per-'ceived that the horſes eaſily diſtinguiſhed 'wholeſome from noxious food; for being very 'hungry, they devoured all ſorts of plants, ex-'cept the following; *meadow ſweet*, *valerian*, '*lilly of the valley*, *angelica*, *looſe-ſtrife*, *marſh-'cinquefoil*, *cranes bill*, *hellebore*, *monks-hood*, and 'many ſhrubs. This gave me a hint to re-'commend to the curious, that they would ſet 'about examining what plants ſuch animals, as 'live on vegetables, viz. *the cow*, the *ſheep*, the '*goat*, the *deer*, the *horſe*, the *hog*, the *monkey*, 'and their ſpecies will not touch. An examina-'tion which would not be without its uſe, were 'it properly made.' Notwithſtanding this recommendation, no enquiry was made, till our preſident returned home from his travels thro' forreign countries, and made a progreſs thro' our own provinces. Afterwards profeſſor Kalm, that worthy diſciple of ſo great a maſter, followed his example; ſo that in his journey to Bahus we find mention made of ſome plants, which cattle either eat, or refuſe. Ann. 1747 and

1748 our preſident undertook with great diligence not only to make experiments himſelf, but to excite his diſciples, and auditors to do the ſame; of which number i was one. Thus at laſt many experiments were made, and repeated, eſpecially by D. D. Hagſtrom, Mag. E. G. Liidbeck, E. Ekelund, J. G. Wahlbom, L. Montin, F. Oldbers, J. C. Forſkahl, A. Fornander; not to mention others, who ſtrove, as it were, to out-do one another in finding the plants, which were ſuitable to different animals.

§. 3.

The difficulty however of examining all the Swediſh plants, and getting animals proper for experiments, which ought all to be repeated, has hindered us from being able to give a compleat work on this ſubject. But the greateſt part, and the moſt common vegetables of Sweden being now determined by us; what is wanting may be ſupplied from time to time. We hinted that animals proper for experiments, which ought to be taken from among *cows*, *goats*, *ſheep*, *horſes*, and *ſwine*, are difficult to be found, for theſe reaſons; firſt, becauſe ſome plants are eaten by them in the ſpring, which they

they will not touch all the ſummer; when they are apt to grow rank in taſte, and ſmell, and become ſtalky and hard. Thus many people eat the *nettle* in the ſpring; but who could bear it afterwards? Again, becauſe ſome kinds of animals eat the flower, and will not eat the ſtalks; others eat the leaves and will not eat the ſtalks. N. B. When they eat the leaves, we ſay in general they eat the plant, otherwiſe there would be few graſſes they could be ſaid to eat. Œcon. Nat. Next, the animals ought not to be over hungry, when we make our experiments, if we intend to make them properly. For they will greedily devour moſt kinds of plants at ſuch a time, which they will abſolutely refuſe at another. Thus when they come immediately out of the houſe, they are not fit to make experiments upon; for then they are ravenous after every green thing that comes in their way. The beſt method is to make the experiments when their bellies are almoſt full, for they are hardly ever ſo intirely. Moreover the plants ought not to be handled by ſweaty hands; ſome animals will refuſe the moſt pleaſing and taſteful in that caſe. We ought to throw them on the ground, and if we find the animal refuſes to eat them, we muſt mix them with

with others that we know they like; and if they ſtill refuſe them, we have a ſure proof; eſpecially if the ſame be tried with many individuals.

§. 4.

Our views do not extend beyond the Swediſh plants, and that for the ſake of our own œconomy. Let foreigners look to that part which concerns themſelves, and thus our work will be confined within moderate bounds. We can produce above 2000 certain experiments, ſome of which were repeated ten times over, ſome twice as often. If we take the *Flora Suecia* Holm. 1745, and put to any herb the generical name, adding the number, and ſome epithet by way of difference, our work will be very much abridged.

§. 5.

It is manifeſt that the vegetable world was intended for the ſupport of the animal world; inſomuch that altho' not a few animals are carnivorous, yet theſe animals which they devour cannot ſubſiſt without vegetables. In this ſpeculation

culation we behold with admiration the wiſdom of the Creator, which has made ſome vegetables abſolutely diſagreeable to ſome animals that live upon plants, while theſe plants are agreeable to others. And there are plants, which are poiſonous to ſome animals, which are very wholeſome to others, and on the contrary. This did not happen by chance, but was contrived for wiſe purpoſes. For if the Author of nature had made all plants equally grateful to all kinds of quadrupeds, it muſt neceſſarily have happened, that one ſpecies of them being remarkably increaſed, another ſpecies muſt have periſhed with hunger, before it could have got into better paſture; the vegetables being conſumed over a large tract of ground. But as it is ordained every ſpecies muſt by force leave certain plants to certain animals, ſo that they always find ſomething to live upon, till they meet with better paſture; in the like manner we find it contrived in relation to the plants themſelves, which do not all grow in the ſame countrey, and climate; but every plant has its place appointed by the Creator, in which it grows more abundantly, than any where elſe. From hence we may obſerve, that thoſe animals, which chiefly live upon particular plants, chiefly abound

abound in certain places. Thus the *lichen* or *liverwort*, Fl. 980. is found in greateſt plenty on the cold alps, and therefore the *rhen deer*, which all winter live moſtly upon this plant, are obliged to live there. The feſtuca, Fl. 94. which floriſhes and ſpreads moſt on dry paſtures, draws the ſheep thither, which above all things delight in that kind of graſs. The ſeeds of the *dwarf birch*, Fl. 777. which afford the beſt ſort of food to the *rough-legg'd partridge*, and the *Norway rat*, Fn. 26. tempt them to dwell in theſe northern parts of the world. *Camels hay*, Mat. Med. 312. which above all plants, thrives on looſe ſand, draws the camel to chooſe thoſe barren places, as they there find food moſt agreeable to them; not to mention many other ſimilar inſtances. Trees, whoſe heads ſhoot up ſo high, that quadrupeds cannot eaſily reach them, afford nouriſhment for that reaſon to more numerous tribes of inſects, as the *ſallow*, the *oak*, the *pear*, &c. The Creator, who moſt wiſely eſtabliſhed this law, has as it were imprinted it on the organs of animals, that they might not offend againſt it thro' ignorance; and as every tranſgreſſion has its puniſhment allotted, ſo alſo no offence againſt the law of nature

nature can eſcape. Animals, which violate this law, are puniſhed by diſeaſes or death; and hence we behold with admiration that brutes, which were deſigned to be guided by inſtinct, can by no means whatever be prevailed upon to act againſt it. If by chance it happens that any animal offends this way, and ſuffers for it, we vulgarly ſay it has taken poiſon; ſo that ignorant people wonder, not to ſay murmur at the wiſe diſpoſition of the Creator, who has produced ſo many noxious plants; but without ſufficient reaſon, for no one plant in the world is univerſally poiſonous, but all things are good, as they came from the hands of the Creator. Phyſicians often mention that this or that plant is deadly, becauſe its particles are of a nature apt to wound the fibres of the body or corrupt the juices. But this is only reſpectively to the ſpecies of animals, e. g. the *ſun-ſpurge*, Fl. 536. has a milky juice, which cauſes blotches in our ſkin and hurts our fibres, and therefore it is ſaid to be poiſonous; yet the *moth*, Fn. 825. almoſt entirely lives upon this plant, and prefers it both for taſte and nouriſhment to all others, as it thrives beſt upon it. Thus one animal leaves that, which to itſelf is poiſonous, to another animal, which feeds upon it deliciouſly.

Long-

Long-leaved water hemlock will kill a *cow*, whereas the *goat* browſes upon it greedily. *Monks-hood* kills a *goat*, but will not hurt a *horſe*; and the *bitter almond* kills a *dog*, but is wholeſome food for *man*. *Parſley* is deadly to *ſmall birds*, while *ſwine* eat it ſafely; and *pepper* is mortal to *ſwine*, and wholeſome to *poultry*. *Thus every creature has its allotted portion.* Animals diſtinguiſh the noxious from the ſalutary by ſmell and taſte. Younger animals have theſe ſenſes more acute, and therefore are more nice in diſtinguiſhing plants. An empty ſtomach will often drive animals to feed upon plants, that were not intended for them by nature. But whenever this has happened they become more cautious for the future, and acquire a certain kind of experience; e. g. *the monks-hood*, which grows near Fahluna, is generally left untouched by all the animals, that are accuſtomed to theſe places; but if forreign cattle are brought thither and meet with this vegetable, they venture to take too large a quantity of it, and are killed [b]. The cattle that have

[b] The ſame thing has been told me by the countrey people in Hereſordſhire in relation to *meadow-ſaffron*, which grows in plenty in ſome parts of that county. Gmelin, Fl. Sibirica, p. 76. ſays that cattle eat the leaves of the *hellebore*, 40. when they firſt ſpring out of the ground, and are thereby killed.

been

been reared in the plains of Schonen, and Weſtrogothia, commonly fall into a dyſentery when they come into the woodland parts, becauſe they feed upon ſome plants, which cattle uſed to thoſe places have learned to avoid. In the ſpring, when the *water hemlock* is under water, ſo that the cows cannot ſmell it, they dye in heaps [c]. But when the ſummer comes on

[c] This affair is of ſo much conſequence to the farmer, that i think it right to tranſcribe a paſſage out of Linnæus upon this ſubject.

"When I arrived, ſays he, at Tornea, the inhabitants complained of a terrible diſeaſe, that raged among the horned cattle, which upon being let into the paſtures in the ſpring, dyed by hundreds. They deſired that I would conſider this affair, and give my advice what was to be done in order to put a ſtop to this evil. After a proper examination, i thought the following circumſtances worth obſerving.

1. That the cattle dyed as ſoon as they left off their winter fodder, and returned to grazing.

2. That the diſeaſe diminiſhed as the ſummer came on, at which time, as well as in the autumn, few dyed.

3. That this diſtemper was propagated irregularly, and not by contagion.

4. That in the ſpring the cows were driven into a meadow near the city, and that they chiefly dyed there.

5. That the ſymptoms varied much, yet agreed in this, that the cattle, upon grazing indiſcriminately on all ſorts of herbs, had their bellies ſwelled, were ſeized with convulſions, and in a few days expired with horrible bellowings.

6. That

on and has dryed the ground, they are very careful not to touch it. It is alſo true, that all vegetables prohibited by nature to particular animals are not equally pernicious; and therefore though through neceſſity and hunger they eat

6. That no man dared to flay the recent carcaſes, as they found by experience, that not only the hands of ſuch as attempted it, but their faces too had been inflamed, and mortified, and that death had enſued.

7. The people enquired of me, whether there were any kinds of poiſonous ſpiders in that meadow, or whether the water which had a yellowiſh tint was not noxious.

8. That it was not a murrain, was clear, becauſe the diſtemper was not contagious, and becauſe that diſtemper is not peculiar to the ſpring. I ſaw no ſpiders but what are common all over Sweden; and as to the water, the ſediment at the bottom, that cauſed the yellowneſs, was nothing but what came from iron.

9. I was ſcarcely got out of the boat, which carried me over the river into the meadow, before i gueſſed the real cauſe of the diſeaſe. For i there beheld the *long-leaved water hemlock*. My reaſons for gueſſing this were as follow.

10. Becauſe in that meadow, where the cattle firſt fell ill, this poiſonous plant grows in great plenty, chiefly near the banks of the river. In other places it was ſcarce.

11. The leaſt attention will convince us that brutes ſhun whatever is hurtfull to them, and diſtinguiſh poiſonous plants from ſalutary by natural inſtinct; ſo that this plant is not eat by them in the ſummer, and autumn, which is the reaſon that in thoſe ſeaſons few cattle dye, viz. only ſuch as either accidentally, or preſſed by extreme hunger, eat of it.

12. But

eat them, yet they do not immediately dye; but it is certain that they cannot have from thence good and proper nouriſhment.

§. 6.

The end of this kind of knowledge is not

12. But when they are let into the paſtures in ſpring, partly from their greedineſs after freſh herbs, and partly from the emptineſs and hunger which they have undergone during a long winter, they devour every green thing which comes in their way. It happens moreover that herbs at this time are ſmall, and ſcarcely ſupply food in ſufficient quantity. They are beſides more juicy, are covered with water, and ſmell leſs ſtrong, ſo that what is noxious, is not eaſily diſcerned from what is wholeſome. I obſerved likewiſe, that the radical leaves were always bitten, the others not; which confirms what i have juſt ſaid.

13. I ſaw this plant in an adjoining meadow mowed along with graſs for winter fodder; and therefore it is not wonderfull, that ſome cattle, tho' but a few, ſhould dye of it in winter.

14. After i left Tornea i ſaw no more of this plant till i came to the vaſt meadows near Limmingen, where it appeared along the road, and when i got into the town i heard the ſame complaints, as at Tornea, of the annual loſs of cattle with the ſame circumſtances.

15. It would therefore be worth while to eradicate carefully theſe plants, which might eaſily be done, as they grow in marſhy grounds; and are not hard to find, as they grow by the ſides of pools or rivers. Or if this could not be done, the cattle ſhould not be ſuffered to go into ſuch places, at leaſt during the ſpring. For i am perſuaded, that later in the year they can diſtinguiſh this plant by the ſmell alone.

bare curioſity, although were this the caſe every part of knowledge, which ſets forth the ſtupendous works of the Creator, is never to be looked upon as of no conſequence. On the other hand, we do not pretend to gain any medicinal advantages from theſe ſpeculations, namely, to be able from hence to conclude, that this or that plant is noxious to man, becauſe it is ſo to this or that brute animal. Nor do we for that reaſon approve of Wepfer's experiments upon dogs, and other animals, as if any knowledge can be thence gained in regard to man. No, the end we aim at is merely œconomical.

α. From theſe experiments we may know whether certain paſtures afford good nouriſhment for this or that ſpecies of animals. We ſee e. g. *heifers* waſte away in encloſures, where the *meadow-ſweet* grows in abundance, and covers the ground ſo that they can ſcarce make their way through it; the countrey people are amazed, and imagine that the paſture is too rich for them; not dreaming that the *meadow-ſweet* affords them no nouriſhment. Whereas the *goat*, which is bleating on the other ſide of the hedge, is not ſuffered to go in, though he longs to be browſing upon this plant, which to him is a moſt delicate and nouriſhing food.

β From

ρ. From theſe experiments we may almoſt be ſure by affinity and analogy, whether meadows or paſtures are ſalutary or noxious to particular animals; e. g. long experience has taught us that our ſheep take up poiſon in marſhy grounds, though no one till lately knew what was the particular poiſon. Yet the *ſpiderwort* 267. the *mouſe-ear ſcorpion graſs* 149. the *mercury* 823. the *ſun-dew* 257,8. the *hairy wood graſs* 287. the *leſſer ſpearwort* 458. the *butterwort* 21. have evidently ſuſpicious marks [c]. I will therefore propoſe a new experiment. The *andromeda* Fl. Virgin. 160. is known to be a moſt rank poiſon to ſheep in Virginia. The *andromeda*, called by the people of New York *dwarf laurel*, Cold. Act. Upſal. 1743. p. 123. is very fatal to the ſheep in New York. Theſe two plants are of a different ſpecies, but of the ſame natural genus, and therefore have the ſame vertues. Amongſt us, eſpecially in the northern parts, the wild *roſemary*, *andromeda*

[c] There is great reaſon to think that what makes low grounds ſo noxious to ſheep is not the moiſture, but the plants that grow there. For it is obſerved by ſhepherds that the great danger to ſheep is immediately after a freſh ſpring of graſs, which i imagine is owing to their licking up the young and tender ſhoots of poiſonous plants, along with their proper food, not being able to diſtinguiſh them.

335. grows every where in marſhy grounds, which being of the ſame natural genus with the foregoing, we may reaſonably conclude that it deſtroys our ſheep. To this we may add, that it is on account of three other ſpecies of *andromeda* 336,7,8. which grow on the Lapland mountains, that the ſheep there never are healthy; and laſtly although the *ciſtus ledon* 341. is not a ſpecies of *andromeda*, yet being of the ſame natural claſs, it is not unlikely but that this plant is far from affording good nouriſhment to ſheep. This conjecture gives our ſhepherds an unexpected opportunity of making experiments with their ſheep; and indeed they cannot omit to do it without being juſtly blameable, ſince on this the health of their whole flock depends. It is particularly to be noted upon this occaſion, that the botany of America, a countrey ſo far disjoyned from us, gives a hint for conſidering things of the greateſt uſe, of which the antients did not ſo much as dream.

7. From hence the œconomiſt may truly judge of his meadows, and know that ſome are vaſtly preferable to others for certain animals. For although cattle, preſſed by neceſſity and hunger, will feed upon vegetables leſs gratefull to them; yet it is not to be doubted but that

they are not equally well nouriſhed by theſe as by others. Thus the Dalecarlians are obliged in a ſcarcity of wheat to ſupport themſelves by *bread* made of the *bark* of the *pine*; yet it does by no means follow from hence that this affords proper nouriſhment. We ſee that *horſes* in time of war, when preſſed by extreme hunger, will eat *dead hedges*, but we cannot hence conclude, that wood is good food for them.

§. The induſtrious farmer may judge from hence, when he ſows his meadows with hay ſeeds for paſture, that it is not indifferent what kinds of ſeeds he chooſes, as the vulgar think. For ſome are fit for *horſes*, others for *cows*, &c. *Horſes* are nicer in chooſing than any of our cattle; *ſiliquoſe* and *ſiliculoſe* plants particularly are not reliſhed by them. *Goats* feed upon a greater variety of plants than any other cattle, but then they chiefly hunt after the extremities and flowers. *Sheep* on the contrary paſs by the flowers and eat the leaves. Not to mention the different diſpoſition in different animals as to grazing near the ground or not. The countreyman who underſtands theſe things, and knows how in conſequence to diſpoſe of his grounds, and aſſign each kind of cattle to its propereſt food, muſt neceſſarily have them more healthy

and fat, than he who is deſtitute of theſe principles. The good œconomiſt will obſerve the ſame of his hay. For although many herbs, when dry, are eat, which when green would be refuſed, it does not follow from hence that they yield good nouriſhment. Much might be added concerning the propenſion of cattle to this or that plant, which the compaſs of this ſmall tract will not admit of; e. g. that *ſheep* above all things delight in the *feſtuca* 95. and grow fatter upon it than any other kind of graſs; that *goats* prefer certain plants, but being led by an inſtinct peculiar to themſelves, they ſearch more after variety, and do not long willingly ſtick to any one kind of food whatever; that *geeſe* are particularly fond of the ſeeds of the *feſtuca*, Fl. 90; that *ſwine* greedily hunt after the roots of the *bull-ruſh* 40. while they are freſh, but will not touch them when dry. Hence it appears that it is in vain to contrive engines to extract the roots of the *bull-ruſh* out of the water, and dry them for the uſe of theſe animals in winter. Becauſe theſe animals ſpoil the meadows, where the *ſcorzonera* grows, in order to come at its root, which they delight in; and alſo the fields, to get at the roots of *clowns-all-heal*, the huſbandman imagines they

do

do good to his fields by ploughing the ground and eating the roots of *couch-graſs*, whereas they never touch them, but when preſſed by the utmoſt neceſſity [d].

§. 7.

To give a view of my deſign in a few words. I have diſpoſed the plants mentioned in the Flora Suecica according to their numbers; and to be as ſhort as poſſible, it was neceſſary to add the generical name with a ſhort and incompleat

[d] In the ſame way with us it is a notion that prevails commonly that *cows* eat the *crow-foot* that abounds in many meadows, and that this occaſions the butter to be yellow, from whence i ſuppoſe it is generally known by the name of the *butter-flower*. But this i believe is all a miſtake, for i never could obſerve that any part of that plant was touched by *cows* or any other cattle. Thus Linnæus obſerves, Fl. Lapp. p. 195. that it was believed by ſome people that the *marſh marygold* made the butter yellow, but he denies that cows ever touch that plant. Yet he thinks that all kinds of paſture will not give that yellowneſs, and then obſerves that the beſt and yelloweſt butter he knows, and which is preferred by the dealers in thoſe parts to all other butter, was made where the *cow-wheat* grew in greater plenty than he ever ſaw any where elſe. This ſhews how very incurious the countrey people are in relation to things they are every day converſant with, and which it concerns them ſo much to know.

epithet, which however may be illuſtrated out of the Flora itſelf. I have diſtinguiſhed the cattle againſt every plant into five columns. The firſt of which contains *oxen*. The ſecond *goats*. The third *ſheep*. The fourth *horſes*. The fifth *ſwine*. By the mark (1) i have denoted thoſe plants which are eaten; by the mark (0) thoſe which are not eaten; by both together thoſe which are ſometimes eaten, ſometimes refuſed; or are eaten when cattle are more uſed to them, and are more hungry, otherwiſe not.

§. 8.

Upon the firſt view of this ſubject the reader will perceive, that it is not treated compleatly, ſo that every Swediſh plant is pointed out, and by what animals it is eaten. What generally happens upon breaking up old paſture lands, viz. that for the firſt years it cannot be cleanſed from all uſeleſs weeds, and be laid down fine like a garden, but will here and there have rough tumps and hard clods, unleſs we will let it lye fallow for a very long time; the ſame or ſomething like it has happened upon this occaſion.

I am

I am apt to believe, however, that the reader will be better pleaſed that i have opened this new ſcene, than if i had waited longer in order to gain farther light. For ſince there are many people here curious in botany and œconomy, i hope they will all lend a helping hand, that i may one day be enabled to give a more compleat edition of this piece [c].

[c] After this in the original follows a long table of experiments, of which i ſhall only give a ſmall ſpecimen; as the whole would increaſe the bulk but not the value of this piece to ſuch readers as this tranſlation is intended for, ſince they would neither know the plants by the names the author has given them, nor by any i could put in their room. However i ſhall for curioſity give a ſpecimen, and add the general reſult of his experiments, juſt as he has marked it at the end of his table; which is as follows. 'Thus far,' ſays he, 'we have given 2314 experiments. 'From theſe it appears that

Oxen eat	276	refuſe	218 plants
Goats	449		126
Sheep	387		141
Horſes	262		212
Swine	72		171

'And thus theſe animals leave untouched 886 plants.
'Theſe animals will not eat any kind of *moſs*.
'The goats are very fond of the *algæ*.
'Some of them greedily devour the *fungi*, others will 'not taſte them. But we recommend farther trials in re-'lation to theſe matters.'

Then follows an account of ſome trials made by Dr. O. Hagſtrom to the ſame purpoſe in relation to *rhen deer*, but

but as they no ways concern us i have omitted to mention them.

N. B. For the table i have choſen not to take ſuch plants as occurred firſt in my author, but to ſelect the graſſes of our own countrey, and have given Engliſh names to them of my own invention, the reaſon of which will appear in the following obſervations.

	O.	G.	S.	H.	Sw.
Spring graſs	1	1	1	1	-
Mat graſs	10	1	1	1	a.
Canary graſs, *reed*	1	1	1	1	o
Cat's-tail, *meadow*	1	1	o	1	o
Fox-tail, *meadow*	10	1	1	1	10
——— *ſlote*	1	1	1	1	o
Millet graſs	1	1	1	-	-
Bent graſs, *ſilky*	-	1	o	1	-
——— *fine*	1	1	-	1	-
Hair graſs, *ſmall leaved*	1	1	1	1	-
——— *water*	1	-	1	1	-
Meadow, *creeping*	1	1	1	1	o
——— *annual*	1	1	1	1	1
——— *great*	1	1	1	1	1
——— *narrow leaved*	1	1	1	1	1
——— *common*	1	1	1	1	1
Cock's-foot graſs, *rough*	o	1	1	1	o
Dog's-tail graſs, *creſted*	-	-	1	-	-
——— *blue*	-	1	1	1	o
Feſcue graſs, *ſlote*	o	1	1	1	10
——— *purple*	1	1	1	1	-
——— *ſheep's*	1	1	11	1	-
Brome graſs, *field*	1	1	1	1	-
——— *ſpiked*	-	1	1	1	-
Oat graſs, *meadow*	1	1	1	1	-
——— *bearded*	-	10	-	-	-

Obſervations on GRASSES.

Obſervations on GRASSES.

AS the foregoing treatiſe contains ſome obſervations on graſſes [f], that are quite new, and as this affair is of the utmoſt importance to the huſbandman, i ſhall ſubjoyn ſome obſervations of my own relating to the ſame ſubject.

It is wonderfull to ſee how long mankind has neglected to make a proper advantage of plants of ſuch importance, and which in almoſt every countrey are the chief food of cattle. The farmer for want of diſtinguiſhing, and ſelecting graſſes for ſeed, fills his paſtures either with weeds, or bad, or improper graſſes; when by making a right choice, after ſome trials he might be ſure of the beſt graſs, and in the greateſt abundance that his land admits of. At preſent if a farmer wants to lay down his land to graſs,

[f] *By graſſes are meant all thoſe plants, which have a round, jointed and hollow ſtem, ſurrounded at each joint with a ſingle leaf, long, narrow and pointed, and whoſe ſeeds are contained in chaffy huſks. It appears by this definition, which is Ray's, that all the kinds of grain, as wheat, oats, barley, &c. are properly graſſes, and that the broad, the white, the hop, &c. clovers are not graſſes, though ſo frequently called by that name.*

what

what does he do? he either takes his ſeeds indiſcriminately from his own foul hayrick, or ſends to his next neighbour for a ſupply. By this means, beſides a certain mixture of all ſorts of rubbiſh, which muſt neceſſarily happen; if he chances to have a large proportion of good ſeeds, it is not unlikely, but that what he intends for dry land may come from moiſt, where it grew naturally, and the contrary [g]. This is ſuch a ſlovenly

[g] *Since the firſt edition of theſe tracts i have had ſeveral opportunities of obſerving inſtances of this ſlovenly kind of huſbandry, and its effects. Inſtead of covering the ground in one year with a good turf, i have ſeen it filled with weeds not natural to it, and which never would have ſprung up, if they had not been brought there.*

Arguments are never wanting in ſupport of ancient cuſtoms, and i am no ſtranger to the arguments, ſuch as they are, which prejudice and indolence have made uſe of on this occaſion.

1. *Some ſay then, that if you manure your ground properly, good graſſes will come of themſelves. I own they will. But the queſtion is how long it will be before that happens, and why be at the expence of ſowing what you muſt afterwards try to kill by manuring? which muſt be the caſe, as long as people ſow all kinds of rubbiſh under the name of hay ſeeds. Again, if the beſt way is to let the ground take its chance, why is the farmer at the expence of procuring the ſeeds of the white, and broad clover, which come up in almoſt all parts of England ſpontaneouſly? but if this is allowed not to be the beſt way in relation to clover of any kind, what reaſon can be in nature, why graſs ſeeds only ought not to be ſown pure?*

2. *Others*

ſlovenly method of proceeding, as one would think could not poſſibly prevail univerſally; yet this is the caſe as to all graſſes except the darnel graſs, and what is known in ſome few counties by the name of the Suffolk graſs; and this latter inſtance is owing, i believe, more to the ſoil than any care of the huſbandman. Now would the farmer be at the pains of ſeparating once in his life half a pint, or a pint of the different kinds of graſs ſeeds [h], and take care

2. *Others ſay, that it is better to have a mixture of different ſeeds. I will ſuppoſe this to be true. But cannot a mixture be had though the ſeeds be gathered, and ſeparated? and is not a mixture by choice more likely to be proper, than one by chance? eſpecially after a ſufficient experience has been had of the particular virtues of each ſort, the different kinds of cattle each graſs is moſt adapted to, the different grounds where they will thrive beſt, &c. all which circumſtances are now in general wholly unknown, though of the utmoſt conſequence.*

3. *It is ſaid by ſome, that weeds will come up along with the graſs. No doubt of it. Can any one imagine that graſs ſeeds ſhould be exempted above from what happens to every other kind of ſeed. But i will venture to ſay, that not near the quantity of weeds will ſpring up which they imagine, if it be ſown very thick. Men muſt be very much put to it, when they make ſuch objections as this laſt, or indeed any of the others. I am almoſt inclined to ſay with a great writer, 'It is a ſimple 'thing to take much pains to anſwer ſimple objections.'*

[h] *I have had frequent experience how eaſy it is to gather the ſeeds of graſſes, having employed children of ten or eleven years old*

care to ſow them ſeparately; in a very little time he would have wherewithal to ſtock his farm properly, according to the nature of each ſoil, and might at the ſame time ſpread theſe ſeeds ſeparately over the nation by ſupplying

old ſeveral times, who have gathered many ſorts for me without making any miſtakes, after i had once ſhewn them the ſorts i wanted.

I have procured thus the creeping bent, the fine bent, the ſheep's feſcue, the creſted dog-tail, &c. in ſufficient quantities to begin a ſtock, but for want of a proper opportunity of cultivating them myſelf, or meeting with any one who had zeal enough to beſtow a proper care on them, my collections of this kind hitherto have only proved that the ſcheme is in itſelf feaſible.

This very year 1761, a little boy by my direction gathered as much of the creſted dog-tail in 3 hours by the ſide of a road, as when ſhed, yielded upon weighing above a quarter of a pound averdupois, perfectly free from huſks. As this ſeed is ſmall the ſkilful will eaſily judge how far ſuch a quantity would go if properly employed.

My very eſtimable and ingenious friend Mr. Aldworth, who was witneſs of the fact which i laſt mentioned, at my deſire ordered a ſmall part of a meadow, near his ſeat at Stanlake, which had better graſſes and leſs mixed than the reſt, to be left unmowed till the ſeeds were fit for gathering. This piece yielded upon threſhing and ſifting a full buſhel by meaſure of almoſt pure ſeed of the creſted dog-tail. In caſe any one ſhould be inclined to follow this example, i think it highly neceſſary to obſerve that care muſt be taken to mow the graſs before it ſheds; that it be mowed very early in the morning before the dew is off the ground, and that it ought not be ſpread as in making hay, but left as it falls from the ſcythe a ſufficient time, and then gently turned over.

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the ſeed-ſhops. The number of graſſes fit for the farmer is, i believe, ſmall; perhaps half a dozen, or half a ſcore are all he need to cultivate; and how ſmall the trouble would be of ſuch a taſk, and how great the benefit, muſt be obvious to every one at firſt ſight. Would not any one be looked on as wild who ſhould ſow *wheat*, *barley*, *oats*, *rye*, *peaſe*, *beans*, *vetches*, *buck-wheat*, *turneps*, and weeds of all ſorts together? yet how is it much leſs abſurd to do what is equivalent in relation to graſſes? does it not import the farmer to have good hay and graſs in plenty? and will cattle thrive equally on all ſorts of food? we know the contrary. Horſes will ſcarcely eat hay, that will do well enough for oxen and cows. Sheep are particularly fond of one ſort of graſs, and fatten upon it faſter, than on any other in Sweden, if we may give credit to Linnæus. And may they not do the ſame in England? How ſhall we know till we have tryed? Nor can we ſay that what is valuable in Sweden may be inferior to many other graſſes in England; ſince it appears by the Flora Suecica that they have all the good ones that we have. But however this may be i ſhould rather chooſe to make experiments, than conjectures.

I now propoſe to add a few obſervations on ſome of our graſſes, as far as i have been able to make any with ſome appearance of probability; but as there has reigned hitherto the greateſt confuſion in the Engliſh names of theſe moſt valuable plants, and as they have never been properly ranged but by Linnæus, i ſhall firſt, in imitation of that great author in his Flora Suecica, give new generical names with trivial ones to diſtinguiſh the ſpecies of all our Engliſh graſſes [i]. I mean all thoſe which are found in that author; as for the reſt, ſince ſome are omitted by him, their names may be eaſily ſupplyed when their genera are ſettled by the learned [k]. It happens very luckily, that our common people know ſcarce any of the graſſes by names, as far as i could ever find by converſing with farmers, huſbandmen, &c. ſo that ſomething may be done to remove this confuſion, if a liſt of names be ſettled and agreed

[i] Mr. Hudſon having thought proper to adopt my names with ſome alterations; and having cleared up many of the ſpecies of graſſes in a better manner than has been done before; i have referred throughout to his Flora Britannica, which is likely to be in the hands of all who are curious in botany.

[k] This has ſince been done in ſome meaſure in the afore-mentioned Flora Britannica.

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on by ſuch as are likely to have influence ſufficient in theſe matters. As to my own liſt, it is only meant as a hint for others to work upon.

In giving names i have had two things in view. Firſt to retain as much as poſſible ſuch as have hitherto been uſed for ſome ſpecies of the genus. Secondly, where that could not be done, to give ſuch as are of eaſy and familiar pronunciation to our common people, and at the ſame time approach as near as poſſible to the Latin names in ſound where they could not be interpreted. This was done for the ſake of the learned, for the more eaſy recollecting the botanical name. Thus i have called the *aira hair*-graſs, the *bromus brome*-graſs, &c. in others i have merely tranſlated the Latin name, as alopecurus *fox-tail* graſs, cynoſurus *dog-tail* graſs, &c.

After theſe preliminary obſervations i hope it will not be neceſſary to make any apology for the liberty i have taken. I am certain that till names properly adapted to the purpoſe be invented, we have little chance of ſeeing any general reformation made in this part of huſbandry; and even after this without ſome perſon properly qualified to direct the countrey people, and ſhew them the graſſes with their names,

nothing will come of that moſt uſeful doctrine delivered in the foregoing treatiſe of Haſſelgren[l]. But it is to be hoped that gentlemen at leaſt will not be ſo incurious as to remain ignorant of what imports them ſo much to know. Nor is the mere botaniſt leſs concerned in the ſucceſs of this ſcheme, for there is great reaſon to think that many of the graſſes are not thoroughly ſettled, varieties perhaps being put for different ſpecies[m]; now this uncertainty can never be better cleared up than by ſowing the ſame kind of ſeeds on different ſoils.

[l] Many people having expreſſed a deſire that i ſhould have plates of ſome of the profitable graſſes added to this piece, that moſt excellent man, the late Mr. Price of Foxley, whoſe extraordinary character i ſhall always revere, and do intend to give a ſketch of on ſome future occaſion, kindly condeſcended to employ his pencil, which in the opinion of the beſt judges was equal to things of a much ſuperior nature, in making me ſeveral drawings from the plants themſelves, and a very able hand has ſupplied the reſt and engraved them all.

[m] Thus Gmelin Flor. Lapp. mentions four of the meadow graſſes which he ſays have for a long time perplexed botaniſts of great reputation. And the editor of Ray's Synopſis, p. 402. doubts whether five graſſes which are put down as different by Petiver be not only varieties of a graſs mentioned before. I have many ſpecimens of this graſs in my collection differing in color, ſtature and outward aſpect, which yet moſt likely are of the ſame ſpecies.

A Table of Engliſh GRASSES.

GENUS 1.

VERNAL graſs, *Tab.* 1. Anthoxanthum *Odoratum* *H. 10. R. 398. 1.

GENUS 2.

MAT graſs — Nardus *Stricta* H. 20. R. 393.2.

GENUS 3.

Manured CANARY graſs — Phalaris *Canarienſis* H. 20. R. 394.

Sea CANARY — Phalaris *Arenaria* H. 21. R. 398.4.

Reed CANARY — Phalaris *Arundinacea* H. 21. R. 400. 1.

Ribband CANARY — Phalaris *ibid. b. ibid.*

GENUS 4.

Green PANIC graſs — Panicum *Viride* H. 21. R. 393.1.

Looſe PANIC — Panicum *Cruſgalli* H. 22. R. 394.2.

Cock's-foot PANIC — Panicum *Sanguinale* H. 22. R. 399. 2.

Creeping PANIC — Panicum *Dactylon* H. 22. R. 399.1.

* N. B. H refers to the Flora Britannica of Mr. Hudſon.

GENUS 5.

Meadow CAT's-TAIL graſs Phleum *Pratenſe* H. 22. R. 398. 1.

Branched CAT's-TAIL Phleum *Paniculatum* H. 23.

Bulbous CAT's-TAIL Phleum *Nodoſum* H. 23. R. 398. 3.

GENUS 6.

Meadow FOX-TAIL graſs, *Tab.* 2. Alopecurus *Pratenſis* H. 23. R. 396. 1.

Field FOX-TAIL Alopecurus *Myoſuroides* H. 23. R. 397.

Bulbous FOX-TAIL Alopecurus *Bulboſus* H. 24. R. 397. 3.

Flote FOX-TAIL Alopecurus *Geniculatus* H. 24. R. 396. 2.

GENUS 7.

FEATHER graſs Stipa *Pennata* H. 24. R. 393. 3.

GENUS 8.

Smooth COCK's-FOOT graſs Dactylis *Cynoſuroides* H. 25. R. 393. 4.

Rough COCK's-FOOT Dactylis *Glomerata* H. 25. R. 400. 2.

GENUS 9.

MILLET graſs Milium *Effuſum* H. 25. R. 402. 1.

GENUS

GENUS 10.

Silky BENT graſs Agroſtis *Spica venti*
H. 26. R. 405. 17.

Brown BENT Agroſtis *Canina*
H. 26.

Red BENT Agroſtis *Rubra*
H. 26. R. 394.4.

Creeping BENT Agroſtis *Stolonifera*
H. 27. R. 402. 2.

Marſh BENT Agroſtis *Paluſtris*
H. 27. R. 404. 11.

Fine BENT *Tab.* 3. Agroſtis *Capillaris*
H. 27. R. 402.4.

Wood BENT Agroſtis *Sylvatica*
H. 28. R. 404.13.

Small BENT Agroſtis *Minima*
H. 28. R. appendix.

GENUS 11.

Creſted HAIR graſs Aira *Criſtata*
H. 28. R. 396.3.

Purple HAIR Aira *Cærulea*
H. 29. R. 404.8.

Water HAIR Aira *Aquatica*
H. 29. R. 402.3.

Turfy HAIR Aira *Ceſpitoſa*
H. 29. R. 403.5.

Mountain HAIR *Tab.* 4. Aira *Flexuoſa*
H. 30. R. 407.8,9.

Small-leaved HAIR Aira *Setacea*
H. 30.

Grey HAIR Aira *Caneſcens*
H. 30. R.405. 16.

Early HAIR Aira *Præcox*
H. 31. R. 407.10.

Silver HAIR *Tab.* 5. Aira *Caryophillea*
H. 31. R. 407.7.

GENUS 12.

MELIC graſs Melica *Nutans*
H. 31. R. 403.6.

GENUS 13.

Middle QUAKING graſs Briza *Media*
H. 32. R. 412.1.

Small QUAKING Briza *Minor*
H. 32. R. 412.2.

GENUS 14.

Water MEADOW graſs Poa *Aquatica*
H. 32. R. 411. 13.

Common MEADOW Poa *Trivialis*
H. 33. R. 409.2.

Great MEADOW *Tab.* 6. Poa *Pratenſis*
H. 33. R. 409. 3.

Creeping MEADOW Poa *Compreſſa*
H. 33. R. 409.5.

Narrow-

Narrow-leaved MEADOW Poa *Anguſtifolia*
H. 34. R. 409. 4.

Bulbous MEADOW Poa *Bulboſa*
H. 34. R. 411. 12.

Hair-leaved MEADOW Poa *Setacea*
H. 34.

Annual MEADOW *Tab.* 7. Poa *Annua*
H. 34. R. 408. 1.

Wood MEADOW Poa *Nemoralis*
H. 34.

Sea MEADOW Poa *Maritima*
H. 35. R. 410. 7.

Hard MEADOW Poa *Rigida*
H. 35. R. 410. 8.

Spiked MEADOW Poa *Loliacea*
H. 35. R. 395. 4.

GENUS 15.

Sheep's FESCUE graſs, *Tab.* 8. Feſtuca *Ovina*
H. 36. R. 410. 9.

FESCUE Feſtuca *Vivipara*
ibid. *b.*

Hard FESCUE Feſtuca *Duriuſcula*
H. 36. R. 413. 4.

Purple FESCUE *Tab.* 9. Feſtuca *Rubra*
H. 36.

Barren FESCUE Feſtuca *Bromoides*
H. 37. R. 415. 13.

Wall

Wall FESCUE Feſtuca *Myurus*
H. 37. R. 411.16.

Tall FESCUE Feſtuca *Elatior*
H. 37. R. 411.15.

Small FESCUE Feſtuca *Decumbens*
H. 38. R. 408.11.

Flote FESCUE *Tab.* 10. Feſtuca *Fluitans*
H. 38. R. 412.17.

Spiked FESCUE Feſtuca *Loliacea*
H. 38.

Wood FESCUE Feſtuca *Sylvatica*
H. 38. R. 394.

GENUS 16.

Field BROME graſs Bromus *Secalinus*
H. 39. R. 413.5. 414.7,8.

Corn BROME Bromus *Arvenſis*
H. 39. R. 414.9.

Upright BROME Bromus *Erectus*
H. 39.

Wall BROME Bromus *Ciliatus*
H. 40. R. 413.2.

Barren BROME Bromus *Sterilis*
H. 40. R. 412.1.

Tall BROME Bromus *Giganteus*
H. 40. R. 415.11.

Wood BROME Bromus *Ramoſus*
H. 40. R. 415.10.

Spiked

Spiked BROME Bromus *Pinnatus*
H. 41. R. 392.

GENUS 17.

Naked OAT graſs Avena *Nuda*
H. 41. R. 389. *b.*

Bearded OAT Avena *Fatua*
H. 41. R. 389.7.

Meadow OAT Avena *Pratenſis*
H. 42. R. 405.1.

Rough OAT Avena *Pubeſcens*
H. 42. R. 406.2.

Tall OAT Avena *Elatior*
H. 42. R. 406.4.

Yellow OAT Avena *Flaveſcens*
H. 42. R. 407.5.

GENUS 18.

Common REED graſs Arundo *Phragmites*
H. 43. R. 401.1.

Branched REED Arundo *Calamagroſtis*
H. 43. R. 401.2.

Small REED Arundo *Epigeios*
H. 43. R. 401.3.

Sea REED Arundo *Arenaria*
H. 43. R. 393.1.

GENUS 19.

Perennial DARNEL graſs Lolium *Perenne*
H. 44. R. 395. 2.

Annual DARNEL Lolium *Temulentum*
H. 44. R. 395.1.

GENUS 20

LYME graſs Elymus *Arenarius*
H. 44. R. 390.3.

GENUS 21.

Common WHEAT graſs Triticum *Repens*
H. 45. R. 390.1.

Bearded WHEAT Triticum *Caninum*
H. 45. R. 390.2.

Sea WHEAT Triticum *Junceum*
H. 45. R. 391.5.

GENUS 22.

BARLEY graſs Hordeum *Murinum*
H. 46. R. 392.3.

GENUS 23.

RYE graſs Secale *Villoſum*
H. 46. R. 392.4.

GENUS 24.

Creſted DOG's-TAIL, graſs *Tab* 11. Cynoſurus *Criſtatus* H. 47. R. 398.2. 399.3.

Rough DOG's-TAIL Cynoſurus *Echinatus*
H. 47. R. 397.5.

Blue DOG's-TAIL Cynoſurus *Cæruleus*
H. 47. R. 399.4.

Bearded DOG's-TAIL Cynoſurus *Paniceus*
H. 47. R. 396.4.

GENUS

GENUS 25.

SOFT graſs Holcus *Lanatus*
H. R. 404. 14.

Genus the firſt. VERNAL. *Tab.* 1.

This graſs grows very commonly on dry hills, and likewiſe on ſound rich meadow land. It is one of the earlieſt graſſes we have, and from its being found on ſuch kinds of paſtures as ſheep are fond of, and from whence excellent mutton comes, it is moſt likely to be a good graſs for ſheep paſtures. It gives a grateful odor to hay.

ADDITION. *This graſs i have found on all kinds of grounds, from the moſt ſandy and dry to the moſt ſtiff and moiſt, and even in bogs. It is very plentiful in the beſt meadows about London, viz. towards Hampſtead and Hendon. It is very eaſy to gather, as i have found by experience; as it ſheds its ſeeds upon the leaſt rubbing.*

Genus the ſixth. *Meadow* FOX-TAIL. *Tab.* 2.

This graſs as well as the foregoing is found in great plenty in our beſt meadows about London, and i believe makes very good hay. Linnæus ſays that it is a proper graſs to ſow on grounds that have been drained.

ADDITION. *I am informed that the beſt*

hay

hay which comes to London is from the meadows, where this graſs abounds. I ſaw this ſpring a meadow not far from Hampſtead, which conſiſted of this graſs chiefly with ſome of the vernal graſs and the corn brome graſs. This graſs is ſcarce in many parts of England, particularly Herefordſhire, Berkſhire and Norfolk. It might be gathered at almoſt any time of the year from hay ricks, as it does not ſhed its ſeeds without rubbing, which is the caſe of but few graſſes.

Water FOX-TAIL.

This is alſo found in the meadows about town, that are ſound but lye under water in the winter, and perhaps might be proper to ſow on ſuch grounds.

Genus the tenth. *Marſh* BENT.

ADDITION. *This graſs grows very commonly in moiſt grounds and ditches in many parts of England, where i have been. I ſhall ſay more of it under article Flote* FESCUE *graſs.*

Fine BENT. *Tab.* 3.

This graſs i have always found in great plenty on the beſt ſheep paſtures, as on Malvern hills, and on all the high grounds in Herefordſhire, that are remarkable for good mutton.

ADDITION. *I may add on Bagſhot heath, and the beſt ſheep paſtures in Berkſhire, Oxfordſhire, and Norfolk.*

Genus

Genus the eleventh. *Mountain* HAIR. *Tab.* 4.

The ſame may be ſaid of this graſs as of the foregoing. It grows in great plenty on Bagſhot heath.

Silver HAIR. *Tab.* 5.

This alſo is found on the ſame kind of paſture as the two foregoing.

Genus the fourteenth. *Great* and *narrow-leaved* MEADOW. *Tab.* 6.

Theſe graſſes are common in our beſt meadow grounds, and i believe make good paſture and hay.

ADDITION. *I have found them frequently on banks by the road ſide, and near ditches, even where they were not to be found in the adjoyning meadows, and paſtures.*

Annual MEADOW. *Tab.* 7.

This graſs makes the fineſt of turfs. It grows every where by way ſides, and on rich ſound commons. It is called in ſome parts the Suffolk graſs. I have ſeen whole fields of it in High Suffolk without any mixture of other graſſes, and as ſome of the beſt ſalt butter we have in London comes from that county, it ismoſt likely to be the beſt graſsfor the dairy. I have ſeen a whole park in Suffolk covered with this graſs, but whether it affords good veniſon i cannot tell, having never taſted of any from it. I ſhould rather think

think not, and that the beſt paſture for ſheep is alſo the beſt for deer. However this wants trial. I remarked on Malvern hill ſomething particular in relation to this graſs. A walk that was made there for the convenience of the water drinkers, in leſs than a year was covered in many places with it, tho' i could not find one ſingle plant of it beſides in any part of the hill. This was no doubt, owing to the frequent treading, which above all things makes this graſs floriſh, and therefore it is evident that rolling muſt be very ſerviceable to it.

ADDITION. *It has been objected that this graſs is not free from bents, by which word is meant the flowering ſtems. I anſwer that this is moſt certainly true, and that there is no graſs without them. But the flowers and ſtems do not grow ſo ſoon brown as thoſe of other graſſes, and being much ſhorter they do not cover the radical leaves ſo much, and therefore this graſs affords a more agreeable turf without mowing, than any other whatever that i know of.*

Sheeps FESCUE. *Tab.* 8.

This is the graſs ſo much eſteemed in Sweden for ſheep.

Gmelin. Flor. Sibir. ſays that the Tartars chooſe to fix during the ſummer in thoſe places where there is the greateſt plenty of this graſs; becauſe

becauſe it affords a moſt wholeſome nouriſhment to all kinds of cattle, but chiefly ſheep; and he obſerves that the ſepulchral monuments of the antient Tartars are moſtly found in places that abound with this graſs, which ſhews, adds he, that it has long been valued amongſt them.

I have among my graſſes a ſpecimen of it, but do not remember where I found it. I am certain it is not common in any of the places where i have been. Perhaps upon examination it may be found on places famous for our beſt mutton, as Banſtead Downs, Church-Stretton in Shropſhire, ſome parts of Wales, &c.

ADDITION. *I have ſince found this graſs in great plenty in many parts of England and Wales; indeed on all the fineſt ſheep paſtures in Herefordſhire, Berkſhire, Oxfordſhire, Norfolk,* &c. *The reaſon why I thought it not common, was, that it is an early graſs, and had ſhed its ſeeds, before i uſually made my ſearches in thoſe places where it only grows. I muſt alſo obſerve that, contrary to what Linnæus ſays, either the ſheep or ſome other animals do eat the flowering ſtems of this graſs, for upon Banſtead Downs there was nothing to be ſeen but the radical leaves of it, unleſs amongſt the buſhes near the hedges, where it was guarded from the ſheep.*

Genus the fifteenth. *Purple* FESCUE. *Tab.* 9.

ADDITION. *This graſs i have always found along with the fine* BENT *and ſilver* HAIR-GRASS, *particularly on Banſtead Downs in great plenty in a place incloſed in order to keep the ſheep out. From hence i am inclined to think that this is the chief graſs all over the Downs, but as the flowering ſtems in the other parts were intirely gone, unleſs along the hedges, I could not be certain.*

Flote FESCUE. *Tab.* 10.

I have no knowledge of the qualities of this graſs from my own experience, but ſhall quote ſomething concerning it out of a piece publiſhed in the Amæn. Academ. vol. 3. entitled Plantæ Eſculentæ. The author ſays there, artic. 90. that the ſeeds of this graſs are gathered yearly in Poland, and from thence carried into Germany and ſometimes into Sweden, and ſold under the name of manna ſeeds. Theſe are much uſed at the tables of the great on account of their nouriſhing quality and agreeable taſte. It is wonderfull, adds the author, that amongſt us theſe ſeeds have hitherto been neglected, ſince they are ſo eaſily collected and cleanſed.

ADDITION. *Mr. Dean, a very ſenſible farmer at Ruſcomb, Berkſhire, aſſured me that a field always lying under water of about four acres,*

that was occupied by his father when he was a boy, was covered with a kind of graſs, that maintained five farm-horſes in good heart from April to the end of harveſt, without giving them any other kind of food, and that it yielded more than they could eat. He at my deſire brought me ſome of the graſs, which proved to be the flote FESCUE *with a mixture of the marſh* BENT; *whether this laſt contributes much towards furniſhing ſo good paſture for horſes i cannot ſay. They both throw out roots at the joynts of the ſtalks, and therefore likely to grow to a great length. In the index of dubious plants at the end of Ray's Synopſis, there is mention made of a graſs under the name of Gramen caninum ſupinum longiſſimum, growing not far from Saliſbury 24 feet long. This muſt by its length be a graſs with a creeping ſtalk; and that there is a graſs in Wiltſhire growing in watery meadows ſo valuable, that an acre of it lets from 10 to 12 pounds, i have been informed by ſeveral perſons. Theſe circumſtances incline me to think it muſt be the flote feſcue; but whatever graſs it be, it certainly muſt deſerve to be inquired after.*

There is a clammineſs on the ear of the flote feſcue, when the ſeeds are ripe that taſtes like honey, as i have often found, and for this reaſon perhaps they are called manna ſeeds.

Linnæus Flor. Suec. art. 95. *ſays, that the bran of this graſs will cure horſes troubled with bots, if kept from drinking for ſome hours.*

Genus the ſeventeenth. *Yellow* OAT.

This graſs is found in great plenty in ſome grounds where the ſheep's FESCUE, *the fine* BENT, *and the creſted* DOG-TAIL *grow, and therefore likely to be good for ſheep. It is alſo not uncommon in good meadows.*

Genus the nineteenth. *Perennial* DARNEL.

This graſs is well known, and cultivated all over England; and it is to be hoped the ſucceſs we have had with it will in time encourage our farmers to take the ſame pains about ſome others that are no leſs valuable, and are full as eaſy to be ſeparated. It makes a moſt excellent turf on ſound rich land where it will remain.

If i may judge by the veniſon i have eat out of a paddock, that was chiefly filled with this graſs, i would by no means recommend it for parks. I know it will be ſaid that veniſon is never good out of a paddock, that the deer muſt have room to range, trees to browſe on, &c. I grant there is ſome reaſon for ſaying this, but i believe in general it is more owing to want of proper food, viz. good graſs, than merely to confinement; for paddocks are generally made by

by converting ſome rich ſpot near the houſe, that has conſtantly been manured, and of courſe is full of graſſes fitter for the dairy or the ſtable than for deer, which hardly ever is the caſe of large parks. No man will, i ſuppoſe, pretend to make good pork from a hog fed with grains inſtead of peas, tho' he has the liberty of chooſing as much ground as he pleaſes, and where he pleaſes.

This graſs is called in many counties *rye* graſs. It were to be wiſhed that the old name might prevail, becauſe there is a genus of graſs, viz. the 22d. known by the name of *rye* all over the kingdom, of which genus there is a ſpecies that ought to bear the ſame generical name.

ADDITION. *I have ſince eaten veniſon out of a large park, where there was much of this graſs, and it was no better than that out of the paddock. I ſhould be apt to think from hence that this graſs would not be proper for ſheep, as i have always obſerved that the ſame kind of ground which yields good veniſon yields alſo good mutton. For what particular uſes it is good, wants to be tryed, whether for the dairy, for fatting cattle, or for horſes. Many are tempted by the facility of procuring the ſeed of this graſs to lay down grounds near their houſes, where they want to have a fine*

turf

turf with it; for which purpoſe unleſs the ſoil be very rich a worſe graſs cannot be ſown, as it will certainly die off in a very few years intirely.

Genus the twenty fourth. *Creſted* DOG-TAIL. *Tab.* 11.

This graſs i imagine is proper for parks. I know one where this abounds, that is famous for excellent veniſon. It may perhaps be as good for ſheep.

ADDITION. *That it is good for ſheep i have ſince found by experience. The beſt mutton i have taſted, next to that which comes from hills where the purple and ſheep's feſcue, the fine bent, and the ſilver hair graſſes abound, having been from ſheep fed with it.*

It makes a very fine turf upon dry ſandy or chalky ſoils, as i have ſeen in many parts of Berkſhire, but unleſs ſwept over with the ſcythe, its flowering ſtems will look brown; which is the caſe of all graſſes, which are not fed by variety of animals. For that ſome animals will eat the flowering ſtems is evident by commons, where ſcarcely any parts of graſſes appear but the radical leaves.

Order of coming into ear of the above mentioned graſſes.

Annual MEADOW
Meadow FOX-TAIL
VERNAL

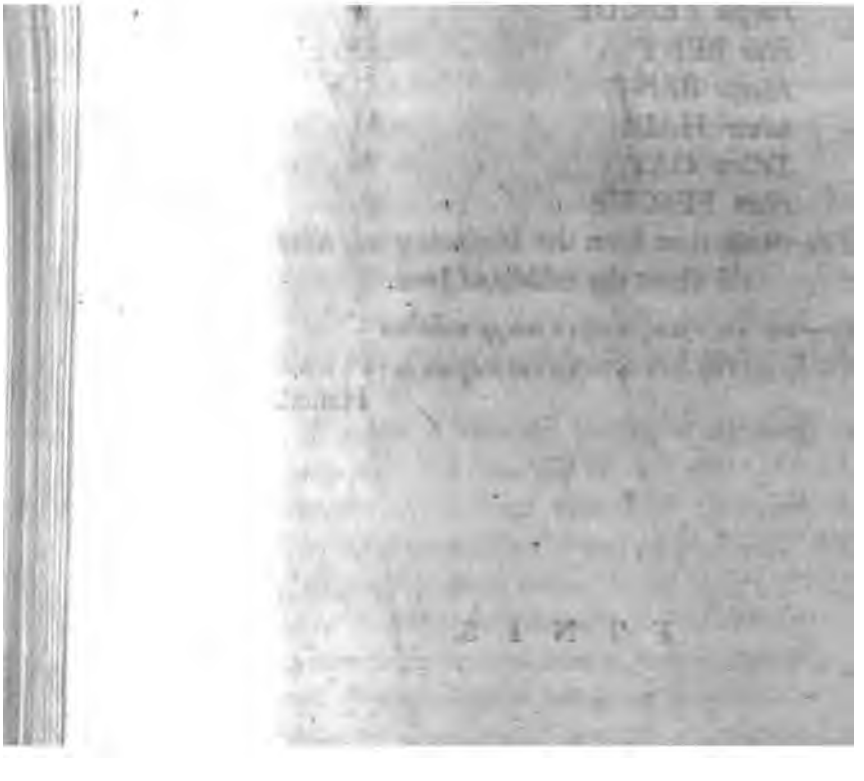
VERNAL

Great MEADOW
Narrow-leaved MEADOW
Creſted DOG-TAIL
Sheep's FESCUE
Purple FESCUE
Fine BENT
Marſh BENT
Silver HAIR
Yellow OAT
Flote FESCUE

The whole time from the beginning of May till about the middle of June.

Ει—κεν και σμικρον επι σμικρῳ καλαθειο
Και θαμα τυθ' ἱρῆοις, ταχα κεν μεγα και τε γενοῖο.
Heſiod.

FINIS.



Tab. 1.

Vernal Grass.

R. Price delin.

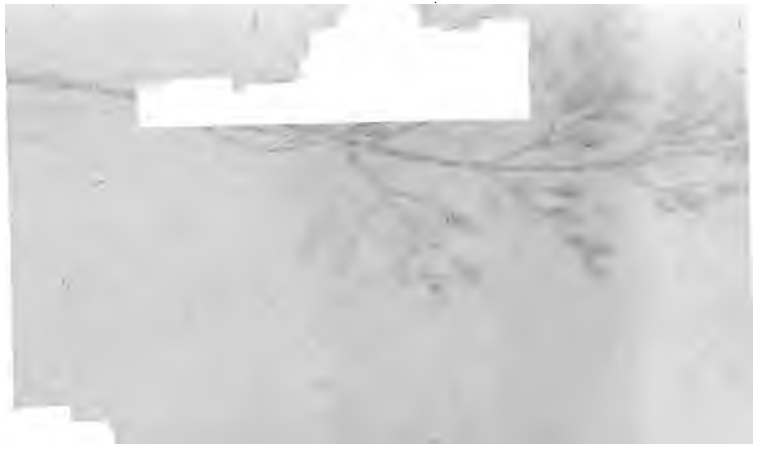
Tab. 2.

R. Price delin. Meadow Fox-tail Grass.

Tab. 3.

Fine Bent Grass.

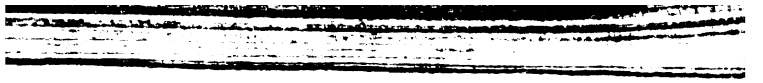
R. Price delin.



Tab. 4.

Mountain Hair Grass.

R. Price delin.



Tab. 5.

Silver Hair-Grass.

Tab. 6

W. Price delin.

Great Meadow Grass.

Tab. 7.

Annual Meadow Grass.

J. Miller del. et sc.

Tab. 8.

Sheeps Fescue Grass.

R. Price delin.

Tab. 9.

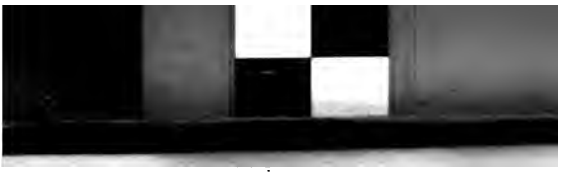
Purple Fescue Grass.

J. Miller del. et sc.

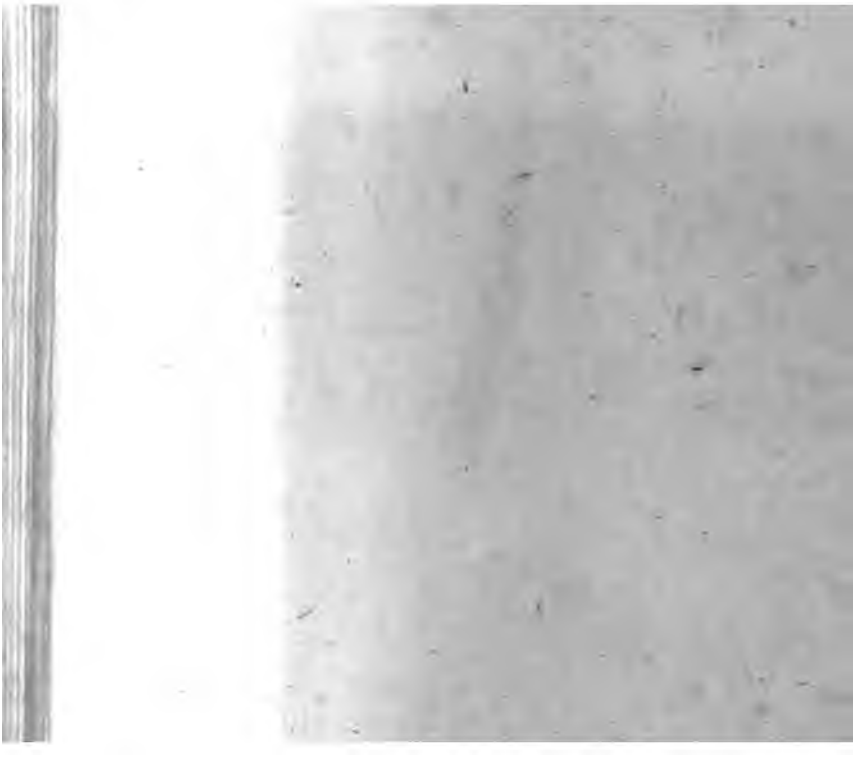
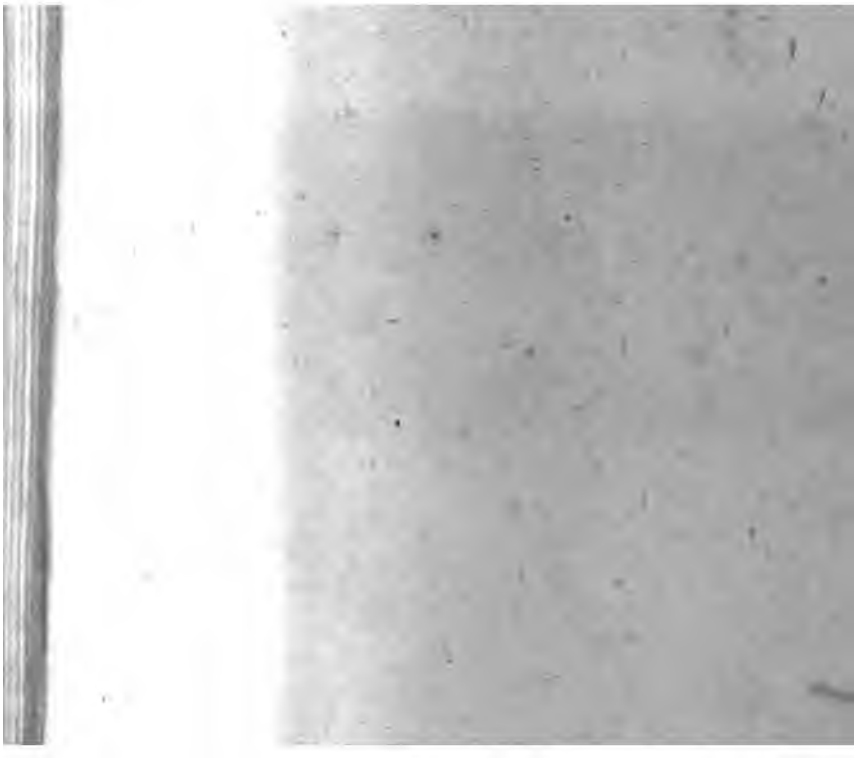
Tab. 10.

Flote Fescue Graſs.

J. Miller del. et sc.



Tab. II.

Crested Dogs-tail Grass.

R. Price delin.